Drawn by D. Wilson LL.D.

THE QUIGRICH.

THE

CANADIAN JOURNAL

OF

INDUSTRY, SCIENCE, AND ART:

CONDUCTED BY

THE EDITING COMMITTEE OF THE CANADIAN INSTITUTE.

NEW SERIES.

VOL. IV.

TORONTO:
PRINTED FOR THE CANADIAN INSTITUTE,
BY LOVELL AND GIBSON, YONGE STREET,
MDCCCLIX.

CANADIAN INSTITUTE.

EDITING COMMITTEE, 1859.

GENERAL EDITOR, . . . DAN. WILSON, LL.D.

I. *Geology and Mineralogy:* E. J. CHAPMAN, Prof. of Geology and Mineralogy, Univ. Coll. Toronto.

II. *Physiology and Natural History:* REV. WM. HINCKS, F.L.S., Prof. of Natural History, Univ. Coll., Toronto.

III. *Ethnology and Archæology:* DANIEL WILSON, LL.D., Prof. of History and English Literature, Univ. Coll., Toronto.

IV. *Meteorology:* G. T. KINGSTON, M.A., Director of the Magnetic Observatory, Toronto.

V. *Chemistry:* HENRY CROFT, D. C. L., Prof. of Chemistry, and Experimental Philosopy, Univ. Coll., Toronto.

VI. *Mathematics and Natural Philosophy:* J. B. CHERRIMAN, M.A. Prof. of Natural Philosophy, Univ. Coll. Toronto.

VII. *Engineering and Architecture:* SANDFORD FLEMING, C.E.

THE CANADIAN JOURNAL.

NEW SERIES.

No. XIX.—JANUARY, 1859.

ON THE HYPOSTOMA OF ASAPHUS CANADENSIS, AND ON A THIRD NEW SPECIES OF ASAPHUS FROM CANADIAN ROCKS.

BY E. J. CHAPMAN,

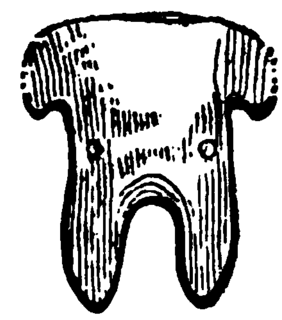
PROFESSOR OF GEOLOGY AND MINERALOGY, UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, December 18th, 1858.

I. ASAPHUS CANADENSIS.

In our recent description of this new species (Canadian Journal, vol. 3, p. 230; and Annals of Natural History, July, 1858), we were unable to give any definite information respecting the form of the hypostoma. Since the publication of this description, however, Mr. J. F. Smith, of Toronto, has found a well preserved hypostoma (evidently belonging to the species in question), in the Utica slate of Whitby, in Canada West—one of the principal localities of the species. By the kindness of Mr. Smith, whose zeal in the service of Canadian palæontology we have already had occasion to acknowledge, we are enabled to lay before our readers a figure of this hypostoma, somewhat enlarged. In its outline, the hypostoma of *Asaphus Canadensis*, as in all the recognised species of the genus *Asaphus*, exhibits the well-known fork or "horse-shoe" at its lower or buccal extremity. The upper margin or so-called "base" is partially obscured, and the wings, or ascending processes by which the hypos-

toma was attached to the under side of the glabella, are also in part concealed. Delicate, irregular striæ are seen on each side of the hypostoma; and two small pits occur, one on each side, at about two-thirds of the distance between the buccal points and the base—our specimen agreeing in this respect with the hypostoma of *Asaphus platycephalus* (= *Isotelus gigas**). The space in the centre, between the pits, is somewhat raised.



HYPOSTOMA OF *Asaphus Canadensis.*

This hypostoma is chiefly interesting as proving our species to be a true *Asaphus*, and not an Ogygia, with which in other respects it has certain affinities. In the Ogygia type, the hypostoma presents an oval outline at its buccal extremity.

II. ASAPHUS HINCKSII.

(A New Species.)

Our colleague, the Rev. William Hincks, Professor of Natural History in University College, Toronto, having been lately on a botanical excursion to the Blue Mountains near Collingwood, in Canada West, collected at the same time a few fossils; and these he has had the kindness to place in our hands. Together with the more common or typical species of the Utica slate (*Graptolithus priodon*, *Triarthrus Beckii*, *Asaphus Canadensis*, &c.), there is a nearly perfect specimen—so far as regards its outline—of a trilobite closely related to *Asaphus platycephalus*. It occurs in a piece of limestone, a portion apparently of one of the calcareous bands interstratified amongst the bituminous shales of the Utica slate. For the information of distant readers, and those unfamiliar with our geology, it may be stated that the Utica slate belongs to the Lower Silurian series—beyond which, with us, as in Europe, the genus *Asaphus* does not appear to pass. Although exceedingly opposed to the extreme multiplication of species, so prevalent amongst palæontologists of the present day, we are compelled, almost against our will, to regard this Collingwood trilobite as new. We beg therefore to name it after the Rev. Professor Hincks, from whom we received the specimen. The general form is that of a narrow oval, with the longer to the shorter or transverse axis about as 5 to 3. The length, in proportion to the breadth, appears somewhat greater than this,

* Also with that of *A. tyrannus*, Murchison, and other European species.

on account of the side lobes being strongly arched. The crust is entirely removed from the thorax, and is only present in traces on the head-shield and pygidium. The latter, like that of *A. platycephalus* (=*Isoletus gigas*), is destitute of segment-markings except in faint traces on the surface below the crust, and the axis is but slightly pronounced. The body-axis, with eight segments, is about as broad as each of the side lobes, or perhaps a little broader—agreeing also, in this respect, with *A. platycephalus*. The pleuræ curve *backwards* (or towards the caudal extremity) at their points; and on each pleura—at about one-third of the distance from the point to the axial furrow, and close to the upper margin—there is a *small but deeply indented pit*. Unfortunately, the stone is broken away for a short space along the outer side of each axial furrow, so that the grooving on the pleuræ (if any be present) is not seen. The outer halves of the pleuræ (speaking always as to the surface under the crust) are however, quite free from any traces of a furrow. If ever present, accordingly, the furrows could only have extended a short distance from the axial groove. The surface of the head-shield is much destroyed, but the lower end of the facial suture is seen to correspond with that of *A. platycephalus*; and the genal extremities terminate in very slightly rounded angles. The usual asaphus-striæ are shewn on the margin of the shell, on both the head shield and pygidium.

OUTER EXTREMITIES OF THREE PLEURÆ OF *Asaphus Hincksii.*

Asaphus Hincksii differs thus from *A. platycephalus* by the peculiar and strongly marked indentations on the pleuræ; and by the ends of the pleuræ curving backwards instead of forwards, and terminating in well-developed points. In *A. platycephalus* they curve forwards, and are rounded off in conformity with the rounded genal angles of the head-shield. The annexed tabular distribution of the four species of Asaphus occurring in Canada, brings out these points of difference more distinctly.

Caudal shield with segment furrows	Head-angles terminating in long points.—*A. Canadensis.* Head angles rounded.—*A. Halli.*
Caudal shield smooth.	Pleuræ curving forwards.—*A. platycephalus.* Pleuræ curving backwards.—*A. Hincksii.*

Or :— Pleuræ curving backwards.	Head-angles terminating in horns; pygidium furrowed.—*A. Canadensis.* Head-angles slightly rounded; pygidium smooth.—*A. Hincksii.*
Pleuræ curving forwards.	Pygidium furrowed.—*A. Halli.* Pygidium smooth.—*A. platycephalus.*

The characters given above, and more especially those founded on the grooving of the pygidium and the direction of the pleuræ, may be thought by some palæontologists to be of little specific value. The segment-markings on the pygidium may be deemed by these observers as characteristic rather of age than of species; but our specimens of *Asaphus Canadensis*, for example, are quite as strongly furrowed when of large as when of small dimensions; and all the perfect specimens of *Asaphus platycephalus* that we have examined, small as well as large, present on the caudal shield an equally smooth surface. The isolated caudal shields hitherto considered to belong to young individuals of the latter species, should be referred, properly, we believe, to *Asaphus Halli.* Secondly, as to the direction of the pleuræ. As this character is more or less related to the genal conformation of the head-shield, it ought certainly to be regarded as one of no mean value. If two species of Asaphi, with forward-curving and backward-curving pleuræ respectively, be examined side by side, the distinction becomes most obvious. The entire conformation of the pleura is affected by it. The pits or row of single indentations on the pleuræ of *Asaphus Hincksii*, constitute, moreover, a peculiar character.

ON PARASITES.

BY LUCIUS OILLE, M.B.

Read before the Canadian Institute, Dec. 4th, 1858.

With the powerful aids which the collateral sciences afford him, and his own habits of careful observation, the modern student of natural history in ranging over the domain of vitality could not fail to notice this numerous and widely distributed class of organisms. Accordingly, these forms of life have received a degree of attention commensurate

with their numbers and importance, and this with decided advantage to the progress of natural science generally.

No more important or welcome contributions have been made within the last few years to the common stock of scientific information than those concerning parasites, whether regarded for their brilliant illustration of the theory of types, the general principles of classification, and the doctrines of physiology, or their practical bearing upon important industrial pursuits, and the science and the art of medicine and veterinary surgery. Although all departments of this extensive subject are full of interest, yet inasmuch as the entozoa and especially those infesting the human subject have been investigated with the most satisfactory results, and present points of singular novelty in their history. I am especially attracted towards them in collecting materials for this article.

Accordingly after a few general observations which the subject naturally suggests, and some necessary brief allusions to individual species of vegetable parasites, which by their singularity or important relations to man especially engage attention, I propose to take into consideration the human entozoa and exhibit as nearly as possible the present condition of scientific knowledge concerning them.

Some allusion will necessarily be made during the course of the investigation to entozoa found only in the lower animals, in order to illustrate more clearly the history of those infesting the human subject. Some important facts I have myself been privileged to verify ; the most of them are given upon the authority of Von Siebold Kuchenmeister, and other distinguished and accurate observers. Whatever theories may be broached must be taken for what they are worth.

The rightful study of natural phenomena induces speculation but does not permit the imagination to run away with the judgment, for it continually induces the mind to trace effects back to their causes, and *felix qui potuit rerum cognoscere causas*. It continually submits the results of previous observation to the trial of new facts. Hence, as the field of positive knowledge widens opinions and theories which once seemed correct are found to be erroneous. The ideas of the previous year are continually revolutionized by the discoveries of the present one, until a primitive fact or law is discovered, which then becomes a foundation for the particular branch of science in which it is found, and as far as it extends gives to that branch the character

of exactness. "The mathematician prescribes conditions for solution and forms of result. He thus dictates to existence,—he determines beforehand what means are wanted and what form the result shall appear in." The natural philosopher on the other hand dictates nothing, he only endeavors to distinguish between what is essential and what is not, in the train of apparent causes to which any given result may be attributed. Confined to study and observation only, he creates nothing—changes nothing. The great field of the actual is spread before him. It embraces facts only with which he is to become acquainted. He reads natural phenomena right onward and takes them in all their significancy as he finds them. Guided by the light of experience the modern enquirer eschews all theories except such as are based upon unmistakable facts. These he collects on every side, and although they should not bear upon the particular subject of investigation which he may have in hand he does not reject them as worthless, but stores them up for future use, confident that they occupy some position of importance in the economy of nature. Thus whilst investigating a point in the physiology of respiration Dalton discovered a rare species of Spiroptera in the right cavity of a dog's heart. Donné discovered in a similar manner the Trichomonas vaginalis, an infusorial animalcula in the morbid vaginal secretion of a female laboring under gonorrhoea. Accident directed Claude Bernard's attention to the glycogenic function of the liver. Numberless additional examples might be adduced, illustrative of the importance of neglecting nothing in a physical examination.

But a simple observation of great numbers of disconnected and disjointed facts, although it may cause astonishment at the versatility of nature, will afford small insight into the hidden laws which regulate their occurrence.

Facts to be of real value must be estimated comparatively and in their proper connection. Such is especially the case in the subject of inquiry which I have proposed to myself. Nowhere is the necessity of carefully conducted and connected observations of more importance than among parasites, and of these the Entozoa *par excellence*. In one place a parasite is seen to reproduce by gemmation, in another by fissation, and still a third by ovulation. Disconnected observation would never establish a connection between all these three forms, and yet nothing is more certain than that they occur in the same animal at different stages of its existence. A microscopic ovule enclosing a

simple organism whose only members are a few small hooklets, is accidentally discovered upon a blade of grass or in a drop of water from a ditch, a cesspool, or stream. Has such a defenceless little creature any relation with the formidable tapeworm that devours the sustenance of the unfortunate victim whose intestines it infests? It was the crowning triumph of German assiduity and skill to establish the fact. In the interior of the tissues and upon the free mucous surfaces of the human and other organisms, secondary organisms of a low grade of development are found, apparently formed in the locality that they inhabit. Whence do they come, and how do they originate? The ancients explained them as freaks of nature, creatures of equivocal or spontaneous generation, *i. e.*, simple results of the concurrent action of the forces at work in the place where they were developed, upon matter collected there. And even since the new era in embryology inaugurated by Redi and Vallisneri there have been, and still are physiologists who maintain the *generatio equivoca* of these beings. Thus we quite recently have Beauchier and Viguier gravely declaring that, "in the predisposition to entozoa the thick mucus of the intestine comes under our consideration, in the first place, as being acid itself it cannot purify the blood from acids. From a portion of the mucus the worms are produced with the assistance of asthenia and adynamia by the *generatio equivoca.* The worms produced are as the analysis shews, still more acid than the mucus from which they are produced. Emetics, drastic purgatives, mercury, antimony and arsenic certainly kill the worms, but weaken the constitution, and thus actually rouse the *generatio equivoca* into activity, and cause the formation of worms," &c., &c. Of such physiologists we must say *scientia non docet.* The zealous researches now prosecuted everywhere in the embryology of the lower animals and especially the entozoa, have, however, routed the partizans of the *generatio equivoca* from their last field of contest, and conclusively established the universal correctness of the doctrine *omne vivum ex ovo.*

The metamorphoses and habits of many of these creatures surpass in strangeness those exhibited by inhabitants of the outer world. Although of simple structure and no particular beauty of form to the eye, the microscope invests them with the fairest proportions and a complexity of structure often surpassing that of higher animals. Active investigations are being conducted among these interesting beings, and new species are continually added to those already known,

some of which latter, however, it is found necessary to consolidate. It is seen that there is hardly a species of plant or animal that does not at some time support one or more species of parasite, yet until a recent period very little positive knowledge was possessed concerning them. That a class of organisms so intimately connected with human welfare as these are found to be, should have remained so long without scientific inquiry, might seem strange, were it not that many of the phenomena connected with them are exceedingly obscure, that their habits are often repulsive, and that they are deficient in those qualities which compel attention to the denizens of the desert and forest, the flocks and herds, the lofty forest trees, the feathered tribes and useful plants.

A few hours, a single night often, has sufficed to usher into being worlds of parasite cryptogams upon the cereal crops, to the entire destruction of the farmer's hopes. Famine even has resulted from their malign luxuriancy of growth. Yet amazement and grief until recently were the only emotions excited by these cryptogams. Their effects were seen and deplored, but no rational investigation was made into the nature and cause of the *blight*, as they were called. With characteristic regard only for the cares and necessities of the present, and carelessness of the future, agriculturists plodded on the daily round of toil, hoping that some time the "blight" would cease to destroy, and plenteousness again repay their labors. Not a year passes that millions of dollars are not paid for the maintenance of such cryptogams as the Uredo, Puccinia, Botrytis, Oidium, and many other fungi, yet it is only now that the history of these parasites is being investigated. In time, with the aid of collateral sciences, among which, not the least important is meteorology, a strong hope may be entertained of protecting plants from their destructive ravages.

The investigations of naturalists have been equally successful among animal as vegetable parasites. These creatures are found in vast abundance upon vegetation from the proud forest tree to the humble blade of grass. Of the many hundred species already known which prey upon vegetation the aphides may be particularly alluded to on account of their puny size, terrible voracity and powers of increase. With a single grasp of the hand thousands of these insects may be annihilated, so helpless are they in their own defence, yet by sheer force of numbers they often thwart the most determined effort to stay their ravages. The strange metamorphoses of this species of

parasite will be noted hereafter. Seuckart says: "Whenever an animal is too small and too imperfectly armed to overawe and destroy that which its instinct leads it to seek for nourishment, it must be content with robbing it by feeding upon its juices and solid parts." Thus the sheep in pasturing in certain localities swallows unconsciously a dreadful enemy—the six-hooked embryo of the Cœnurus cerebralis encased in its coat of mail: for such in truth may be called in its particular case the eggshell in which it is securely developed, amid the hazardous vicissitudes to which it is exposed. Set free from this ovular envelope by the action of the digestive juices in the alimentary canal, the cœnurus commences an active-passive migration to the brain, where it causes the disease well known as the "staggers," from a prominent symptom manifested. The disease called the "measles" in the hog depends upon a similar cystic worm the cysticercus cellulosæ. Carnivora like the wolf, the dog, and man himself, feeding upon these infected herbivora, become themselves infested with tape worms.

From the preceding observations it may be gathered, that parasites exert a very decided influence over man's natural well-being, through their ravages upon his means of support. Yet the discoveries that have been made regarding them are among the crowning triumphs of the scientific skill, industry, and acumen of the observers of the present day, in contradistinction to those of the past.

But still farther. The science and the art of medicine have for many centuries been cultivated with zeal and assiduity by a class of men who specially devoted their attention to the subject. The diseases which affect the human frame have always been regarded as worthy of special attention, and honors and emoluments have been heaped upon the successful physician. But strange to say, until the present century the parasites infesting the human subject remained in almost total obscurity. By some fatality the small number of disconnected facts with which the elder physicians *were* familiar, received a false interpretation. Their production, mode of nutrition, and anatomy, were all misunderstood, and the symptoms supposed to indicate their presence were vague, trivial, and incongruous. There was a general opinion among medical men of their vast abundance which, as may be easily imagined, found an exaggerated reflection among the laity. In fact *worms* were the bugbear of old women and anxious mothers. Even at the present day the physician who prac-

tises much among the common class of people will often find the question of entozoa gravely mooted in his presence. In those palmy days of empiricism as soon as a child presented any of the incongruous symptoms supposed to indicate the presence of these dire destroyers of juvenile health and comfort, straightway, in the quaint language of Kuchenmeister, "the time-honored worm medicine was administered with one hand, under terror of the wholesome birch wielded by the other." If the domestic remedies did not succeed in expelling the unwelcome intruders, or in curing the cachexia upon which they were supposed to depend, the family physician, or perhaps some great specialist upon worms, was summoned, who skilfully directing his medication to the supposed indications, either removed the causative cachexia; or, by a *coup de maitre*, killed the entozoa without injuring the living covers that they infested; or, by altering the character of the intestinal secretions, rendered them no longer acceptable to their despoilers; or, lastly, by such mechanical irritants as the enema, drove the intruders out of the intestines. Often after the administration of powerful drastic and chologogue cathartics, the copious digestions of blood-altered bile, and intestinal mucus, were triumphantly pointed to as the mangled remains of animals, whose very presence was problematical. All this is happily altered now. Although entozoa are as abundant as of yore, yet the improved knowledge which present physicians possess of their pathology and treatment, has greatly humanized this department of medicine. To cause dangerous mucoenteritis in the expulsion of entozoa would now be considered mal-practice.

The wonderful discoveries that have been made by means of the microscope among parasites infesting the human subject constitute a basis for startling speculation. Thus, diseases that used to be attributed to other causes are now boldly referred to a parasitic origin, although the parasites may not be discovered. The Cholera Asiatica of the present century, the Black Death, and Sweating Sickness of former periods, present many features and analogies favorable to this supposition. The highest powers of the microscope have failed to define the limits of vitality, so vastly minute are some of the animalcular inhabitants of the earth. Hence, although we should fail to detect them, microscopic organisms may still be the cause of disease. Their presence in such a case would need to be determined by negative evidence,—the diagnosis made by exclusion. The probabil-

ity of success is, under the circumstances, sufficiently dubious. Speculations based upon negative evidence, though interesting and supported by numerous analogies, are not reliable, from the impossibility of knowing all the circumstances that bear upon the case in point. It seems proved, however, that the germs of future organisms float in myriads through the air and in the water, and that they lie everywhere upon the surface of the earth.

Man is accustomed to pride himself upon his position at the head of animated nature, yet in the exercise of those powers which are his prerogative he exposes himself to vicissitudes and dangers that he often does not appreciate, and from which the inferior animals are more or less exempt. Accustomed from his birth to one climate he rushes into a very different one, and retaining his original habits under very different circumstances, he pays a double penalty for his rashness: first, of disease; secondly, of the entozoa to which that disease supplies a suitable nidus for development. In seeking his pleasure wherever and whenever he lists, fortunate indeed is it for him that he affords so few conditions as he does for the development of parasites. For does he scent the perfumed gales from the orange groves of the south, or snuff the cold air from off the icebergs at the north, he takes into his aerial passages the invisible germs of future organisms. Does he tickle his palate with the delicious fruits of the tropics, or make a frugal meal like the Esquimaux, of train oil and tallow, on the shores of the Arctic sea, down his throat by thousands go the dormant seeds of future evil. Insinuated into his lungs, nose, mouth, and cutaneous follicles, and scattered over his whole body, the microscopic germs await their destiny.

This much, the microscopic and other observations absolutely demonstrate. That single experiment of Schultz of Berlin, is conclusive upon this point, and at the same time confutes most of the arguments in favour of the *generatio equivoca*. He took a flask and placed in it a vegetable infusion. A cork with an apparatus of two tubes bent to a suitable form and with bulbs blown upon them, was carefully inserted into the flask, sulphuric acid was placed in the one tube, and in the other caustic potash. Air from time to time was sucked through the tubes and consequently through the flask also. After a couple of months the infusion remained free from cryptogams and infusoria. The cork was then removed and the infusion exposed to the air, in a few days the infusion swarmed with life. During the

first part of the experiment the invisible spores and ovules in the air sucked through the tubes were exposed to the action of the acid and alkali, and killed. In the latter part, the air freighted with the invisible germs came in direct contact with the infusion, and those germs finding there a suitable nidus for development, gave origin to the living beings witnessed. If then it is established that each one of us breathes an air laden with the germs of organisms that only want a nidus for development; that with the food we eat, and especially the water we drink, additional germs are introduced into our system by another channel; if as we know positively by abundant observation, we ourselves as well as the lower animals and plants are the actual habitat of parasites; let us by all the means at our command, ascertain the conditions of existence and ways of life of those beings, that as far as possible the material well-being of our race, and the interests of natural science may be promoted. The discussion that is still open as to the origin of numerous cutaneous diseases demonstrates the necessity of eliminating all causes of error from investigations of such obscurity. Gruby, Gulliver, and other careful observers positively maintain the parasitic origin of *porrigo favosa.* Wilson in an article, every page of which is the expression of careful researches, denies the presence of any cryptogam in the crust, and shows that the first named observers were misled by deceptive appearances. Both parties thus investigate the same result but trace it to different causes.

The vastness of the obscurity which rests upon the subject of parasites naturally leads to much speculation. Facts here as elsewhere are made the basis of undue generalization.

The domain of reason which is the result of experience lies beside that of imagination, and many avenues lead from one into the other. The ascertained fecundity of parasites, the new species continually discovered in the most unexpected places with the various morbid symptoms which they are *known* to cause, easily lead to the supposition of the parasitic origin of diseases which really arise from other causes. Thus with the growth of natural science do its requirements for additional investigation augment. Questions are perpetually reopened that were once supposed to be definitely settled, and new ones are raised. From each rugged summit upon the hill of science that its devotee attains, he sees others still more difficult of access rising above him. But still he struggles on although often with naught but

the beacon light of hope to guide him,—the *mens conscia recti* to invigorate him. Although great additions have been made within the present century to the list of known parasites, it is still far from complete: vide *Rudolphi Synop. Ent.* The migratory habits of animal parasites are a source of much difficulty in tracing their history. In fact it is the greatest impediment in the way of investigation. The condition of their existence being so much specialized, so dissimilar and often so far asunder from one another. Innumerable abortive experiments require to be made before those conditions are all examined, and the entire history of the particular organism which is the subject of investigation ascertained. Impelled by instinct they traverse the organisms which they infest, or leave them for the outer world. They also are transferred passively from place to place, from organism to organism. For example the six-hooked embryo of the cestoid entozoa having been set free in the interior of the alimentary canal of various animals, migrates actively into a portal vessel, then passively floating in the circulating blood it lodges in some remote capillary and renews the active migration, passing into the interior of the tissues which its instinct leads it to select for its dwelling place, preceding its development into a cystic worm.

How many observations required to be made to determine this single fact? A six-hooked animal was seen in the intestine of a cystic worm in a distinct tissue, a strong imagination would hardly have suggested any relation between them.

A cercaria without sexual organs and two thirds tail, swims freely in the water among little mollusks like the paludina. In the interior of one of these mollusks is found a distoma with several organs, but without tail, and in no respect resembling the cercaria. It would not be expected that these two animals had any relation, yet the cercaria is developed into the distoma. In this connection, mention need but be made of Kuchenmeister who for four years was vainly on the look out for a tænia belonging to the cysticercus of the meal-worm; of Filippi, who opened hundreds of animals to trace the development of the eggs of distoma into cercaria. Simple in apparent structure though they be, rude and loathsome to the eye, not from any special deformity but from association, these entozoa afford a deep insight into the mysteries of vitality. The higher organisms that inhabit the outer world, are opaque, and consequently present insuperable obstacles to the ocular examinations of their vital functions, no light

however powerful can pierce the outer envelope of their digestive passages and permit a view of the digestive process as it actually occurs. In impenetrable darkness is that great problem worked out continually, and glimpses of it only, are caught by the experimentalist, who establishing fistulæ at various places in the course of the intestine, withdraws at will the materials in the neighborhood, for purposes of examination.

The ovaries and testes form ovules and zoosperms, the precious depositories of the vital principle for perpetuation of species. The highest interest is therefore attached to them. But the action of these organs can only be judged of by their effect, withdrawn from the body from time to time. To trace the successive stages of the formation of ovules and zoosperms *in situ*, is impossible.

But in the entozoa, and the simple animals that dwell in the depths of the seas, provision is made for those examinations which in the higher animals are impossible.

These creatures, passing their lives away from the light, are quite diaphanous. Their simple cellular structure also favors examination. Placed in suitable media, in the living state, all the details of their structure and functions can be examined from the beginning to the close of their existence. They, as it were, invite science to the study of life under sufficiently simple forms for comprehension. Each atom of food may be traced through all the changes that it undergoes. Thus, in the interior of man's own organism, in that very digestive passage whose functions are such a mystery, a structure is formed which will yet serve to explain the very function which produced it. At the culminating point of animal development the simplest living forms appear, and extremes meeting on a common ground, reveal a general law: the identity of digestion throughout the animal scale. Such nematode entozoa as the ascaris mystan (parasite to the cat,) possessing a genital system exactly fitted for the purpose, have served to reveal the entire process of formation in ovules and zoosperms, the impregnation of the former by the latter, and their subsequent history. Placed beneath the microscope they assume a magnitude suitable for examination. It may further be remarked in this place that many of these creatures so slightly disturb the health of the animals they inhabit, and are so constantly present, that the experimentalist soon ceases to regard them as morbid phenomena.

Are these creatures then unworthy of scientific enquiry? Let the

indefatigable zeal with which modern helminthologists pursue their favourite study answer. Consider Rudolphi who consecrated a life to the collection and classification of parasites; Bremser who collected in his *Atlas* the greatest number of facts upon the subject known at his time; Dujardin who in five years explored 3000 animals in search of parasites; Leuwenhoeck, who maintained two pediculi in his stockings for two months, to ascertain their power of increase. To form the museum of helminthology at Vienna and collect 368 specimens, in five years, forty-five thousand vertebrata were opened.

Ignoring the prejudices of the vulgar mind, the modern naturalist pushes his researches into the most remote localities, the most forbidding places, confident that his labours will not be fruitless. Their functions, numbers, history, intimate relation with industrial pursuits, and with medicine, all combine to give interest to parasites.

Each tissue in plants and animals seems adapted to support some special inhabitant. Among vegetables, the root, bark, duramen, and above all, the leaves, support a numerous secondary existence; and animals are equally liable to the encroachment of parasites. One species infests the cellular tissue, another the brain, another the liver, and so on.

The aphides, from their numbers and peculiar embryology, merit special attention. One species at least, and often several, of these diminutive creatures belong to every species of plant. The sensibilities of some of them are so acute that only a single species of plant will serve for their food. Others are not so susceptible, but subsist upon all leaves that they light upon. The procreative powers of these creatures are so enormous, that Reaumur estimated 5,904,900,000, as the possible offspring in the fifth generation from a single aphis. This fecundity sufficiently accounts for the enormous destruction of plants which they yearly inflict. Not unfrequently they have caused such fearful ravages over large regions of country, that governments have adopted compulsory measures for their destruction. They constitute many of the blights spoken of in common parlance. Their embryology as far as I know has no parallel among the rest of the insect world, but finds its analogies among the entozoa.

Provision is always carefully made to keep each species of animal in due bounds. Those creatures that are most liable to destruction have the greatest powers of reproduction.

The codfish lays its 9,000,000 eggs, the shark its dozens. Those of the codfish are naked and defenceless, whilst the others are carefully protected by a horny and persistent covering. The cercaria marginata leaves its sporocyst and the body of the paludina where it was generated, and swims in the surrounding water. Although numerous animals have been examined, the particular species in which it can develope into a distoma has not yet been discovered. Hence the chances for the destruction of this parasite vastly exceed those favorable to its final development. Accordingly this species of cercaria is produced in great abundance, so great indeed, that they often completely fill the testes and ovaries of the paludina in which they are developed.

Pathological conditions as well as those that are physiological afford a nidus for the development of parasites.

The class of parasites infesting the animal creation, to which by far the greatest interest is attached, are the Entozoa. They have received a corresponding degree of attention. The perfect adaptation of all living beings to the circumstances in which they are intended to pass their existence, is a never ending source of admiration to the scientific observer.

Turning to these Entozoa, we see purpose or function just as strongly manifested as elsewhere. High intelligence has been provided for in the conditions of the air and dry land. Here, in the interior of organisms, enshrouded in darkness, and in relation with vitalized structures, what sort of organization would be expected? The intelligence required for the obtaining of their food is a minimum, for their food is prepared at hand; muscular activity of any kind is as unnecessary as intelligence, with the absence of muscular development a nervous apparatus is unnecessary. Food is prepared already elaborated, hence no digestive apparatus, or only a simple one is required.

Accordingly upon examination of these creatures we find no definite nervous system, no muscular development or a feeble one, no brain, no digestive canal, (with exceptions.) Eyes these animals have not, for they could see nothing if they possessed them. Ears they have not, for no waves of sound ever approach them, a general sense of touch it is to be presumed they have. They must be amenable to the great law of *omne vivum ex ovo; i. e.* they have a very complete generative apparatus, which is always present in the perfect

individual. Their history has been examined with great care by modern observers, and some departments of the subject have been investigated wit great success.

Of all the classes, the Cestoidea are best understood. Many interesting facts in connection with the Trematoda are known, but others still require elucidation; and the same remark is applicable to the Nematoidea.

All sorts of animals have been opened in search of Entozoa, and when discovered, their anatomy and physiology have been carefully scrutinized, so as to determine their affinities.

When it is recollected that Helminthology as a science dates from a very recent period, that the metamorphoses of Entozoa are extraordinary, and without apparent analogy among the animals inhabiting the outer world, as they were known to the older naturalists, there is abundant reason for satisfaction at the position which this department of Zoology at present occupies. The facts discovered are *new;* the mind has not habitually contemplated them, hence their due value as yet, may not be accurately determined. In Linnæus' Natural System, 12th edition, eleven species of intestinal worms are described. In Rudolphi's Synopsis entozoorum, nearly one thousand are catalogued. Since his time, some of his species have been corrected and consolidated, but others have been discovered.

Here as elsewhere, presumption has impeded the acquisition of positive knowledge. Nature has often been interrogated in a wrong spirit. Observers have not invariably manifested a single-hearted desire for the truth, irrespective of preconceived notions. False impressions acquired by one sided and too hasty observations have not unfrequently been pertinaciously maintained, with an unfairness highly reprehensible. When Von Siebold established the identity of the scolex of the cystic worms with the head of the tape-worms, he did good service to the cause of science. But his pertinacious maintenance of his opinion that the cystic worms were strayed and degenerate or monstrous cestoids, long stood in the way of the acceptance of the true explanation concerning these two forms.

Many of the older naturalists, because they could not *see* certain entozoa spring from eggs, although sexual, considered their origin spontaneous.

The identity of the scolex of the cystic worm, with the head of the cestoid having been ascertained, an important question yet remained

for investigation, viz: whether the caudal vesicle of the former was to be regarded as the result of circumstances, or a stage in the ordinary development of the perfect animal from the six hooked embryo. It will be seen that this is a part of the general question, how far external circumstances modify the growth and development of an organism. Do types change? A question of the highest importance, and which lies at the base of all physiological science. It bears upon the important subject of classification, without which, zoology and botany would be a mere jumble, what in fact chemistry was, until the discovery of homologies. It therefore may justly be considered before proceeding to the classification of the entozoa.

An extended survey of the animal kingdom establishes positively the fact that there is a progression which is quite regular, from the simplest infusory animalcule, up to man. Cuvier's observations prove that animals after the precise types of the present, were in existence 4,000 years ago, and that the fossil animals were of different species. If present types have existed so long and fossil ones have perished with the cessation of the conditions necessary for their maintenance, the conclusion seems irrefragable that types are constant. This constancy is preserved through the medium of a continual succession of individuals, that find suitable conditions always for their development. When those conditions terminate, the succession also terminates, and with new arrangements of matter appears a new type that goes on as before. It may be here observed that all man's efforts at the so called improvement of useful plants and animals have merely resulted in modifications of growth, and not in development.

I shall now give the classification of entozoa as it is generally adopted at present.

Being the expression of actual fact it is reliable. The general characteristics of the species of entozoa infesting at some time the human subject will then be given, and afterwards, their embryology.

ENTOZOA (*Helminthes.*)

Class I.

No intestines.......	Sexes united ... Soft integument	Order 1. Cestoidea.
No mouth or anus	Sexes separate... Soft integument	Order 2. Acanthocephala.

Class II.

Intestine terminating in a cæcal extremity, without anus .... Sexes united..................................	Order 3. Trematoda.

Class III.

A perfect intestine Sexes distinct......	Mouth situated on the ventral surface provided with four retractile hooks...	Order 4. Acanthotheca.
	Mouth at or near the anterior extremity and without retractile hooks	Order 5. Nematoidea.

It will be observed that sexuality is an essential characteristic of all the classes with the order beneath them. All such transitory forms, as cystic worms, cercaria, &c., which are mere stages of development from the egg to the perfect animal, are struck out of the general classification and placed among the characteristics of species. The consideration of their embryology will shew that there would be as great impropriety in classifying cercaria, as a larva or chrysalis of insects. Such names as cercaria, redia, &c., will be retained, but with the proviso that they do not indicate species, but different *stages* of species.

The general characteristics of the orders infesting man will now be given. In their embryology such additional particulars will be given as are necessary to elucidate the subject.

Order 1. Cestoidea.

The body is soft, elongated, flattened, jointed, terminated anteriorly in a cephalic enlargement to which it is mostly united for some time. The whole together constitutes a strobila. The head or scolex is pyriform in shape, and furnished with four (or two) sucking discs often also supplied with hooklets.

The joints or proglides are destitute of external organs and have embryos armed with hooks. They have no intestine The cestoidea have no true alimentary canal. In the tænia there are merely

two small longitudinal excavations in the solid tissues of these animals terminating anteriorly in the minute pore in the centre of the head and united by cross excavations in the joints. The heads of the cestoidea being so constantly armed with hooklets and sucking discs they must be designed to fasten upon the intestinal mucous membrane and absorb therefrom a portion at least of their nourishment.

Five metamorphoses are observed in this order:—1. The mature or perfect animal (proglottis). 2. The hooked embryos. 3. The resting scolex, appearing, (*a*) with vesicular appendages; (*b*) a hand like appendage; (*c*) no appendage. 4. The active scolex. 5. strobila.

Family I. Bothriocephali.

These animals are furnished with two lateral depressions or sucking discs upon the head, which is more or less tetragonal. The depressions are usually naked. The head is obtusely conical.

The strobila has a dorsal and ventral surface. Four margins are defined on each segment,—the two lateral free,—the anterior and posterior unite the segment to its anterior and posterior neighbors.

The genital pores are situated in the mesian line. It is most common in Russia and Poland. Numerous other members of the family have been described, but as they do not occur in the human body, and their cystic worms have not been discovered, I omit further allusion to them and proceed to the

Family II. Tæniæ.

This family is a very extensive one, finding its especial habitat in fishes, the perfect animal being most abundant in the predacious ones. It occurs also in piscivorous raptorial birds. Among mammals it occurs to a certain extent when they live on the sea shore at the north. Those living inland are exempt, except man, in whom only is found the Taenia solium. He being omnivorous, there is a strong presumption that he introduces along with his marine food the scolices of this parasite.

The experiments of Eschricht seem to prove that a species of ligula is one stage of its development. This ligula is found in large quantities in the flesh of the dorse and other fish inhabiting the northern seas.

The head is usually somewhat square shaped, with four (rarely six) lateral sucking discs placed symmetrically round the central pore which represents the mouth. This central pore is the anterior termination of the two lateral excavations in the parenchyma of the body already alluded to. It is surrounded by a crown of hooklets arranged in one or more rows, and of various sizes and shapes in the different species. The design of these hooklets in combination with the sucking discs is to anchor the animal firmly to the intestinal mucous membrane, so as to enable it to nourish itself with the alimentary juices of the animal which it infests.

The hooklets probably fall off with age.

The body is ribbcn-like, very long, white, marked by transverse lines dividing it into joints.

The mature joints or proglottides are bisexual, rupturing successively one after another. The joints nearest the head are always younger than those more remote. Each new joint budding from the posterior aspect of the head or scolex pushes backward the next in age. The transverse striations are very obscure among the newer joints.

The genital pores are usually alternate, the males larger and more anterior, the females smaller and more posterior. Male and female organs perfect. The resting scolices according to species assume the cystic forms, that with a hand-like appendage or that without any appendage.

The active scolices vary much with the strobila in length and breadth. The embryos are armed with six hooklets, small and active.

The eggs of those species assuming the cystic form are very small, yellow. Those of the species assuming the two latter forms are larger and lighter in colour. Habitat of mature animal, the intestines. This family is very extensively distributed, being frequently found in the human intestines and in mammalia generally. The resting scolices are found in the serous cavities and various tissues of the smaller and more defenceless animals of whatever species which are preyed upon by the larger and more formidable ones. They also undoubtedly occur occasionally in the same animal whose intestines are infested by the perfect tape worm. In the former case the six-hooked embryos are cast into the outer world enveloped in their egg-shells and subsequently swallowed. In the latter they escape from the egg shells in the intestine of the animal subject to the mature

worm, and take up the requisite migration to the wished for tissue or locality. These remarks apply to the cystic form of resting scolex. The other two forms probably pass through the stage of resting into active scolex in the intestines of the same animal.

The perfect tape worms found in the alimentary canal of man are the Tænia solium (passim) Tænia mediocanullata, in various parts of Europe; a variety found at Cape of Good Hope, which possibly may be identical with the Tænia mediocanullata and the Tænia nance. This latter is probably the mature animal from the Echinoccus hominis.

The Cysticercus cellulosae found so abundantly in the pig, sheep and rabbit, and also in man, is the cystic worm corresponding to the Tænia solium. The scolex of Tænia mediocanullata is unknown to Kuchenmeister.

The Cysticercus termicellis is occasionally found in the abdominal cavity of man, more frequently in the sheep, ox, hog, ape, goat. The tape worm or tænia ex cysticercus termicelle is the tænia marginalis of Batsch, found in the intestine of the dog and wolf.

The Tænia Solium

is misnamed, as undoubted examples are known of several individuals growing simultaneously in the same intestine.

The head varies in size, but is never seen larger than a millet seed. When magnified it is square shaped. The hooks are arranged in two rows and are 24–28 in number. They are planted in little sacs whose depth corresponds with the stem of the hooks in length.

The points of all the hooks fall in the same circle. The most characteristic mark of this species, says Kuchenmeister, is the lunate notch in the stems of the hooks, on their posterior surface.

The length of the first series of hooks varies from 0,175—215 mil. Of the second series from 0,117—126 mil.

The sucking discs, four in number, are nearly circular. From each of the discs a canal descends, which all unite with the two longitudinal ones. The neck is quite short and smooth. Behind the neck is the body or strobila, which consists of joints which are larger and more strongly marked as they approach maturity. From about the 280th segment the genital apparatus begins to appear. These organs will be described with the embryology. The individual joints present at their anterior extremity a transverse canal connecting the longitudinal

ones, a chitirious epidermis, longitudinal and transverse muscular fibres, the uterus and its appendages, with the ova and the male apparatus.

The scolex of the tænia solium and the cysticercus cellulosæ are identical. This is apparent from the similarity in anatomical structure and from experiment. It has now been determined beyond controversy that by feeding the hog, rabbit and sheep with the eggs of the tænia solium those animals became infested with the cysticercus cellulosæ, and by feeding the dog and man with those cystic worms, tape worms were produced in their intestines. The abundance of cysticerci in the hog is well known. Statistics abundantly prove the frequent occurrence of tape worm in butchers who are accustomed to handle raw meat and are not over careful or cleanly, but often by their hands or knives rubbed in their mouths introduce the cystic worms into their system. It is also common among those who eat in any manner raw or imperfectly cooked meat contaminated with the cysticerci. The Hottentots in the Caffir wars demonstrated the mode of translation of the cystic worms into the suitable nidus for the final stage of development, namely, the intestine. Those people in the invasion of the enemy's territory feasted according to their barbarous fashion upon the cattle and sheep that were captured, and became greatly infested with tape worm, whilst previously they were mostly exempt.

The cysticerci occur most abundantly in the muscles of the hog, giving the meat, it will be recollected, the common name of measly. They are found frequently in man. Five cases are certainly known of the occurrence of this creature in the anterior chamber of the eye floating free. It has been found in the eyelids, in the orbit, under the sclerotic conjunctiva, in the vitreous humour, and in the retina. It has been found in the brain, muscles, cellular tissue, &c. When seated in the subcutaneous cellular tissue it is harmless, in the muscles also it usually causes no inconvenience. In the eye the pathological conditions induced are of more importance.

The Tænia medio-canellata of Kuchenmeister is not sufficiently well known to deserve a detailed description. Of its existence he is positive, and he gives some facts connected with its habits. Its scolex is unknown.

The cysticercus visceralis or tumicellis occurring occasionally in the abdominal cavity of the human subject, is remarkable for its enor-

mous caudal vesicle, which in animals has been seen as large as a child's head. The hooks are arranged in two rows upon the tetragonal head; the neck is somewhat slender, whence the name. A tænia in all respects like the tænia marginata has been produced in the dog by feeding that animal with the cystic worm.

The second order is not found in the human subject. The best known representative is the Echinorhynchus gigas, which occurs in the small intestine of the hog and various other animals. The metamorphoses of the order are not yet known.

I omit a description of this order and proceed with that of the third.

Order III. Trematoda.

These are solitary animals, mostly hermaphrodite. They have median or lateral suctorial pores. The alimentary canal is usually branched (rarely single). Evolution is mostly accomplished by metamorphoses, and very often by alternate generation.

This is a very extensive and very interesting order, but does not find its habitat to any great extent in man. Two families only have been found in man.

Family 1. Monostoma.

The body is soft, elongated, polymorphous, flattened, or slightly rounded. The head is continuous or discrete with a neck. The mouth is terminal or anterior, acetabular, crenulate, armed or unarmed. The genital aperture is distinct and double, the male anterior to the female acetubular. The penis is protractile. The female aperture is small and inconspicuous. Habitat: Mammals, birds, amphibia and fishes. Always outside the alimentary tract, and either free or enclosed in sacs. Metamorphoses and alternate generation occur as in the next.

Family 2. Distoma.

The body is flattened or somewhat rounded. Anteriorly there is a circular sucker or disc in which the mouth opens; posteriorly there is another sucker. The two suckers serve to enable the animal to attach itself firmly to the vascular structures, from which it derives nutriment. The posterior disc is sessile or pedunculated, and placed at various distances from the caudal extremity. The generative organs occupy a large portion of the body.

The genital apertures are approximated.

The perfect animal is completely hermaphrodite.

The ovules contain embryos rarely like their parents. In the miniature state their embryos wander free in the outer world or remain enclosed in the parenchyma of organs, especially in the inferior animals. In this miniature or larva condition these animals are called cercariæ. They are sexless invariably. Observation upon the monostoma mutabile demonstrates, that from the eggs of the Trematoda issues a simple saccular structure or organism, to which the name sporocyst has been applied. In the interior of this sporocyst, a number of second cysts are formed and in the interior of these cercariæ. The cercaria escapes from its "nurse" or sporocyst, and finding its requisite nidus for development produces a trematode worm.

The Monostoma lentis, Distoma hepaticum, Distoma baematobium and Distoma lanceolatum are the Trematoda thus far found in the human subject.

The fourth order, Acanthotheca, does not occur in the human subject. It includes the gordiacea or hair like worms which infest the frog, among other animals. I omit further mention of it and proceed to the 5th order, the Nematoidea. This order is the highest of the Entozoa in the scale of organization, as is seen from the table. The muscular system being now clearly developed, a corresponding supply of innervation mu-t be provided. Accordingly nervous filaments connect the various fasciculi together so as to secure greater power of locomotion and prehension. The intestinal tube is limited by a special membrane and is lodged along with other organs in an abdominal cavity. The animals are, however, destitute of special senses and nervous centres, so that common sensation is still their highest attribute.

Many points connected with the history of this order are still in obscurity. The Trichina spiralis which occurs in the muscular system of man so abundantly, is classified in this order, although without sexual system. It is probably a stage of development of some one of the sexual worms, and the Trichocephalus dispar is as likely as any other.

Order V. Nematoidea.

The body is rounded, attenuated more or less, thread-like, elastic, with anal orifice, central or subcentral. The intestines perfect, anus

distinct. The Nematoidea occurring in the human subject are Trichocephalus dispar, Oxyuris vermicularis, Strongylus gigas, Filaria medinensis, Ascaris lumbricoides, Spiraptera hominis, Ancyclostoma duodenale.

Trichocephalus dispar.

The body is long and formed of two parts. The anterior is quite thin and thread like; the posterior is thick and contains the genital organs. The male is smaller than the female. The testicle and spermatic cord are simple. The latter opens with the intestine into a common cloaca. The penis is simple.

The caudal extremity is supplied with an auxiliary copulatory organ. The zoosperms are globular.

The female is straighter, somewhat broader, less elastic and flexible than the male. The caudal extremity is acuminate. The vagina is muscular and opens on the ventral surface, both uterus and ovary are simple. The ovules are brownish—oblong—provided at each extremity with a small but distinct wart-like prominence. Generation—oviparous.

Oxyuris.

The body is cylindrical or fusiform. The head is unarmed—the mouth is terminal orbicular or triangular. The æsophagus is muscular. The gastric cavity is triangular. The intestine in the female opens anterior to the acuminate tail. In the male it opens in the centre of the tail which is obtuse.

The males are almost microscopic in size, mostly seen curled in spirals blunted at the posterior extremity, The females are larger than the males and have a sharp tail; a bilocular uterus with two ovaries, the vagina always in the anterior part of the body, where the external genital orifice is also situated. Length 5-6 lines.

This worm inhabits the larger intestines of children, causing sometimes much irritation.

Ascaris.

The body is white, sub-cylindrical, attenuated on each side, marked with four whitish longitudinal lines. The skin is transversely striated. The anterior extremity is marked by three convex or hemispherical valves. They serve as lips to aid the animal in fixing itself on the spot where it is to derive its nourishment.

The æsophagus is strongly muscular, cylindrical or claviform. The

ventral cavity is triangular. The male is smaller than the female. The caudal extremity somewhat curved and involuted.

The much convoluted testis terminates at the tail in a retractile penis.

The female is larger than the male. The tail is straighter and longer. The vagina is simple and is situated anteriorly to the middle of the ventral surface. The uterus is single and large, the ovarian apparatus double, extensive and convoluted. The variety found in man infests the small intestines.

The Filaria Medinensis as it is found in the subcutaneous cellular tissue of the human subject is about as thick as a crow's quill, several feet in length, white in color and commonly single, although there may be several worms at the same time in different parts of the body. In tropical regions of the East it infests both natives and Europeans, although the latter much more rarely. It has the ordinary characteristics of a Filaria. A round elastic elongated body, a terminal orbicular mouth. The body continuous with the head, the œsophagus is short and tolerably straight. The anus terminal or anterior to the caudal extremity. The skin is striated. The males of this Filaria are not known. The vagina in the female is anterior, near the mouth, double, as is the uterus. It is viviparous.

The common tank worm of the East is probably the Filaria M. in an earlier stage of existence. This tank worm, brought into contact by whatever means with the naked skin, insinuates itself into a cutaneous follicle, which it may well do from its small size, and boring its way into the subcutaneous cellular tissues, in time becomes the Filaria. The origin of the tank worm is unknown. It is a significant fact that whilst the pus from the abscess formed by the Filaria often abounds in small so-called Filariae; they never develope themselves into animals like the parent. This would seem to indicate that the so-called viviparous female is a mere sporocyst, like that of the Distoma.

The Ancyclostoma Duodenale occurs along the river Nile in vast numbers; it is quite small, but provided with a most effectual oval apparatus for fastening upon the intestinal mucous membrane, whose small bloodvessels it often cuts across and thereby causes hæmorrhage that is not unfrequently fatal. It subsists upon blood—at least that fluid is to be seen in it. The prominent symptoms that result from its attacks are those of anæmia with intestinal irritation.

Having briefly given the prominent characteristics of the Nematode worms infesting the human body, I proceed to consider the embryology of the entozoa, especially the Cestoids.

Embryology of Entozoa.

These beings which are so universally distributed that there is hardly an animal exempt from their attacks at some time in the course of its life: whence do they come? how do they develope and how multiply? Are they the spontaneous result of the concurrence of physiological and pathological conditions in which they are produced? or do they originate from parent organisms in the usual way of generation that obtains among the higher animals? If so, how far do surrounding circumstances affect their growth and development? The six-hooked embryo of a Tænia gets into a serous cavity or into cellular tissue and becomes a vascular worm, a Tænia head or larva with a caudal vesicle, instead of the strobila which should develope from that head larva or scolex, were it in the alimentary canal. Is that vesicle the result of the abnormal conditions in which this strayed embryo has fixed itself?

A cercaria swims freely in the water without sexual organs, digestive cavity, or aught but a propulsive tail; when transferred to the interior of a mollusk it so radically changes itself that analogy is lost between the two forms that it has assumed. Is this change due to circumstances?

Such questions as those necessarily arise in entering upon the study of helminthic embryology. And it is at once seen that they are of the highest importance, not only in regard to these worms themselves, but also for their bearing upon high principles of general physiology. A suitable reply can only be made to them by extended observation. By gathering facts for embryology from all parts of the animal scale, a rational scheme of the subject can be made. Such points as are obscure at one part of the animal scale may be explained by such as are of a similar nature, but in more obvious relations at another part. Positive knowledge of the higher animals rests upon and illustrates the obscurities of the helminthic worms, and these in turn bear upon the study of the creatures that rank above them.

The mystery which enshrouded the embryology of the higher animals has been well cleared up. With infinite labor a connected series of observations upon the subject has been made, from the concourse of the zoosperm and ovule to the evolution of the perfect animal.

The following laws are the result. They are positive. Laws of Generation:

I. All animals spring ultimately from eggs.

II. These eggs are spontaneously produced in the female.

III. These eggs are spontaneously discharged.

IV. Zoosperms are spontaneously produced in the male.

V. These Zoosperms must come in actual contact whilst living with ovules of the same species, whereby those ovules are fertilized.

VI. In the higher animals the spontaneous production of eggs is periodical.

These laws were established by observations among all classes of vertebrata.

Abundant observation among invertebrata establishes their applicability (with the exception of the sixth) to these animals as well.

The separation of male and female organs in different individuals is by no means essential. They may exist as well in the *same* individual. Many of the invertebrata are hermaphrodite. In some cases the concurrence of two individuals, as in the case of snails, seems to be necessary, but in others the male part, through an intromittent organ, brings the zoosperms in relation with the ovules in the female generative passages without any concourse of separate individuals. Fecundation having by whatever process been accomplished, development proceeds, through the primary step of segmentation of the vitellus and disappearance of the germinal vesicle. A blastodermic membrane is formed by the packing of cells against the vitelline membrane, and then fusing together more or less completely. This stage accomplished, an organised structure has been formed, myriads of such structures are to be seen floating in water, constituting the simpler infusoria. These have the power of generation by gemmation and fissation, but alternately both they and their progeny assume a more complex structure, and in a male and female apparatus of some kind produce zoosperms and ovules. Sooner or later the gemmation and fissation are exhausted, and a recurrence to the ovular generation takes place.

This principle lies at the foundation of all the complex phenomena that are manifested in the evolution of animal organisms.

But after the blastodermic membrane has been formed a special concentration of cells may take place at some part of the membrane, and an organism of higher type appear.

Specialization still going on, a well defined body with organs is evolved, and so through a succession of stages starting from the primal segmentation even man's most complex organism is produced.

Regarding the influence of surrounding circumstances upon the development of the entozoa, the reflected light from the higher animals must be serviceable. By simply observing the essential difference between the cystic and cestoid worms, many enquirers have felt compelled to refer the phenomena to external influence. The similarity of the heads of those two worms clearly indicated that they were of the same animal, and direct experiment proved that a cystic worm when introduced into the alimentary canal of a suitable animal developed into a cestoid, but how to account for the caudal vesicle, present as it was under one set of circumstances, and cast off under another, was the question. Let us see how far the observed development of some of the higher animals bears upon the question at issue. At first the fecundated ovules of all vertebrata have essentially the same characteristics. Let us follow the history of one in the human female. Having lodged upon the mucous membrane of the uterus that has undergone suitable preparation, pending the arrival of the expected guest, it passes through the stage of segmentation, then successively appear the various organs of the body, and after the suitable pitch of development has been attained, to fit the fœtus for another stage of existence, it is extruded from the habitation that it so long had occupied into the outer world. Now at one period of its intra-uterine life this fœtus was completely destitute of several organs, and of very simple structure generally. It therefore was in the same physiological condition as the cercaria, the trichina spiralis, the cystic and other sexless worms, except that the human fœtus was securely lodged always in the same locality, in the uterus of the mother, whilst those *other* animals are in the outer world or in the tissues of animals of different species from themselves. Yet the influence of surrounding circumstances is highly important in developmental history.

The cercaria which at one time finds its proper element in the water, would perish if transferred too soon into some other medium. The cystic worm if suddenly hurried from its home in the cellular tissues or a serous cavity would also perish. It is needless to say that *abortion* is necessarily followed by the death of the human ovum.

Again at certain stages of its existence the human embryo has special organs adapted to its requirements at the time. Thus at first it is

nourished at the expense of the umbilical vesicle, a suitable communication is requisite for the purpose. Accordingly tbe omphalo merentine vessels are produced to carry the needful supplies from the vesicle to the embryo. But soon this source of nourishment becomes exhausted, and the now enlarged and more developed fœtus needs a more abundant supply than the umbilical vesicle could afford at any time; moreover an apparatus is required to remove from it effete matter, for there is a destructive metamorphosis of tissue in development as in maintenance. To meet this want, there buds out from the cloacal extremity of the alimentary canal, which by this time has assumed shape, the *allantois* which continually and rapidly enlarging fore and aft and laterally inside the chorion, and approaching nearer and nearer to that outer envelope, finally comes into immediate contact with it. This accomplished, it insinuates its terminal capillary loops of bloodvessels, which by arteries and veins are perpetually in anastomatic connection with the fœtal vessels, into the villosities of the chorion. These in time being insinuated into the continually enlarging and divaricating tubular follicles of the hypertrophied uterine mucous membrane, an intimate relation is established between the maternal vessels on the one hand, and the fœtal ones on the other. Whilst the fœtal and maternal vessels are brought into the closest relation by this wonderful contrivance, no anastomosis takes place between them. That would defeat the whole matter. Now by endosmose nutriment is transferred through the intervening walls from the maternal vessels to the fœtal ones. Of all contrivances in nature for the accomplishment of any purpose this is among the most perfect. Upon it alone the defenders of our inherent vital force might take their stand. At the same time it is seen that material conditions and their affections concur in the final result.

This subsidiary circulation becomes the placental, and continues until birth. Then the embryo no longer needing its use, it is cast off, and a new circulation established that holds during the rest of life. Now compare this apparatus with the caudal vesicle of the cystic worm. If it were required to construct a nutrient apparatus in which a tænoid scolex should safely develope in the interior of a serous cavity or in cellular tissue, could a more appropriate one be made than that same caudal vesicle? There could not. It completely meets its requirements as a protecting and nutrient apparatus, and no more can be demanded.

It, as well as the placenta, is an apparatus developed to meet a certain purpose, and that purpose accomplished it atrophies and is removed.

If the caudal vesicle were a monstrosity it could not be so uniformly produced as it is. Monstrosities are rare exceptions and not a rule.

But the human organism affords further analogies. At one time the foetal liver is the largest organ in the body,—later it assumes a subordinate position. During foetal life the thymus gland is quite large and highly vascular. After birth it atrophies and often disappears.

At one time the function of kidneys is performed by the Woolfian bodies, by and by these atrophy and disappear, whilst the true kidneys simultaneously develop and take their place. Hence it is shewn that the requirements of the human organism at any time are met by the development of organs to meet those requirements, and when they have discharged their function and are no longer required they assume a subordinate position or disappear, whilst new ones take their place. The same principle holds good among the Entozoa. The embryo of the frog at one time is as simple in structure as any entozoon. After a time it becomes a tadpole, breathes by gills like a fish, and with its enormous tail sculls through the water. Later, its caudal appendage and gills atrophy, lungs take the place of the latter, feet and legs that of the former, and the fish has become a reptile. Yet it is the same offspring of the same egg.

If the batrachian ovule were deposited on the land it would never develope a tadpole; cast into the outer world the human ovule soon perishes.

The preceding considerations demonstrate the existence of a typical force from within, that in necessary connection with external circumstances projects into existence whatever organ is required for the accomplishment of a function.

Turning now to the Entozoa we are prepared to find them obeying the same laws that regulate the development of the higher animals. No metamorphoses which they manifest are without an analogy elsewhere. No greater difference in type exists in the various phases of their development than are seen in the human or batrachian embryo.

It is in the vicissitudes of their career that they differ chiefly from the higher animals. They have to make migrations both active and passive to find the suitable conditions for development. Hence arises the enormous difficulty of following them continuously shewing

their progress from the egg to the perfect animal. The necessary conditions cannot be *inferred,* they need to be ascertained by actual observation. All the metamorphic changes which mammalian embryos undergo are performed in a single locality, viz., the maternal generative passages. Their identity is always certain. The metamorphoses of the entozoa occurring in different localities and in widely different organisms, identity is always in doubt.

Were the case different,—did the mammalian embryo at that early period, when its identity could not be determined from the closest examination, find its nidus for development elsewhere than in the maternal uterus, its embryology would become vastly more difficult.

Therefore the determination of locality is an important element in the embryology of Entozoa. And often when the right animal has been found for the development of an entozoon a stage, and the creature in the preceding stage has been placed in the desired locality, development does not proceed. Thus Kuchenmeister fed a pig with mature proglottides of the tænia, no cysticerci apppeared in the flesh of the pig. A second pig was fed in a similar manner and still no result followed. Three sucking pigs were fed with proglottides and in due time vast numbers of cysticerci were found in their bodies.

Hence it is not merely the particular species of animal that must be known to supply the requisite nidus for development, but also one with the proper idiosyncracy, so to speak, or at any rate the proper physiological conditions. Of the nature of those precise physiological conditions we as yet are profoundly ignorant. How many men there are who unconsciously swallow live six-hooked embryos and resting scolices, and escape infection we know not.

Having thus invoked the aid of comparative physiology to elucidate the subject, I proceed to trace the development of the *cestoid entozoa.*

A few notes of additional points in the anatomy of the perfect animal are desirable before proceeding with the subject.

The Proglottis

is hermaphrodite. The two sets of generative organs are entirely distinct. The male apparatus consists of a testis, vas deferens, and an intromittent organ, which last, when not in use, is retracted in an inverted manner into a sac. The female apparatus is complicated and peculiar. It consists of one external genital orifice or vagina,—copulatory vesicle (receptaculum spermatozoorum),—matrix or uterus,

and a complicated ovary. One part of the ovary forms the germinal vesicle, the other forms the vitelline substance. The germigine and vitelligine are both double. The two parts of the vitelligine unite in a common canal, into which open the two divisions of the germigine.

At the suitable period the intromittent organ is everted from its sac and introduced into the vagina; the zoosperms are then deposited in the vagina whence they are conveyed into the copulatory vesicle. Intromission having been accomplished the penis is restored to its sac. Now the germinative vesicles may be seen passing successively towards the matrix. When they arrive at the opening of the vitelligine they receive a covering of vitelline substance which is coincidently injected into the canal of the germigine. Enveloped in vitellus the germinative vesicle passes on, and the two elements being combined, the resultant ovule is prepared for fecundation. As the ovule passes onward toward the matrix it appears before the orifice of the copulatory vesicle, then one or more zoosperms are coincidently ejected from the vesicle and coming into actual contact with the ovule fecundate it, as it continues its course towards the uterus. The uterus gradually fills with fecundated ovules, and as it enlarges by excentric pressure it encroaches upon the parenchyma of the proglottis, so that finally the proglottis becomes little more than an egg sac. The ovulation being complete. the proglottis either separates from its younger neighbours anteriorly or remains in connection with them. In either case when the suitable conditions for development are presented, and they are in the intestines and the outer world, the segmentation of the vitellus and disappearance of the germinative vesicle take place precisely as in other animals. The mulberry appearance in due time appears, and the variously hexagonal cells divided from the segmentation of the vitellus, form the layer beneath the vitelline membrane which is called the blastodermic membrane. The remnants of the vitellus with some serous fluid occupy the interior of this membrane. Now the *area germinativa* appears, and cells heaping and condensing together in this area gradually assume the shape of the famed six-hooked embryo. The mature proglottides, *i. e.* those with developed embryos, singly or several united together, escape into the outer world with the fæces, and unruptured (occasionally ruptured). In the outer world they migrate in various directions, appearing upon grass, in the water, &c. If they have been deposited by birds with their fæces upon the foliage of trees they will be found in such localities. Also, if the

proglottides fall into the water they swell up and rupture, strewing the eggs about. Thus in various ways the eggs are distributed in the outer world, some exposed, others still in the proglottides. If a proglottis chance to rest upon a morsel of food of any animal, it is swallowed, and passing into the stomach the outer envelope of the eggs is digested off. In this case numerous cystic worms will be generated in the same animal. If single eggs are swallowed there will only be one cystic worm.

Having discharged its contents the function of the proglottis ceases.

The Six-Hooked Embryo.

The egg having arrived in the intestine of its destined host, either singly or in company with others, its shell ruptures and the six-hooked embryo issues forth.

ITS ANATOMY.

A globular naked vesicle, varying in size from 0, 022 to 0, 05 mim. without internal organs, and provided on its anterior extremity with six, (occasionally four,) microscopic hooklets, whose points are directed downwards. The rupture of the egg shell takes place chiefly in the stomach.

PHYSIOLOGY.

It is nourished by imbibition,—is not acted upon by the intestinal juices of its host,—is capable of voluntary motion.

ITS DESTINY.

Whether in the stomach or intestine, after the escape from the shell, the embryo fastens by means of its hooklets upon the structure of its host, and according to Van Beneden, it brings together the central pair of hooklets like a wedge and by thrusting and twisting begins to force them forward. Having thus made some progress, it assists itself by the use of the two lateral pairs of hooklets. By this boring movement it penetrates into the tissues and into the portal vessels. Having thus entered the circulation, it is carried to distant parts of the body. After a passive migration in this manner, it sticks fast in a capillary somewhere, and again commences an active migration or encysts itself there. Having migrated to the locality which is favourable for its future development it fixes itself.* Having

* The embryos of some species migrate actively only.

fixed itself in a suitable locality, it enters the third stage of its development—the formation of the resting scolex.

THE RESTING SCOLEX.

This stage consists in the formation of cestoid heads from the embryonal vesicle, in a state of rest. The heads, or scolices, may be formed in the interior of the vesicle or upon its outer surface. The embryonal vesicle acting as a foreign body excites an abnormal vascular activity round it, and plastic matter being thrown out, it finally becomes encysted. The cyst is the result of the ordinary processes that are adopted in the organism to repair injury. If the embryo is in a serous cavity it may not have the cyst formed around it.

The embryo begins to dilate by the absorption of liquid nourishment.

It is now requisite to follow separately, the three modes of development of scolices, from cystic worms.

1st. *Cysticercus.* A single scolex is formed on the anterior part of the globular vesicle. At its anterior extremity, where the six hooklets are situated, a depression is formed in the enlarged embryonal vesicle. This depression deepens, and the inverted anterior portion of the limitary membrane looks toward the inner surface of the posterior part of the vesicle. In the bottom of the depression the scolex is formed inverted. That part of the enlarged embryonal vesicle which is not implicated in the metamorphic changes connected with the head, becomes the well known caudal vesicle. There is a thickening and condensation of cells at the bottom of the cephalic pit. These gradually assume the form of cestoid heads, always inverted. The sucking discs, usually four in number, and the proboscis with its crown of hooks. If examined, the head may be seen as it were sitting at the bottom of the pit in which it is formed, and may be everted by pressure when it assumes precisely the appearance of the cestoid head.

The hooks are usually completed in the fifth or sixth week. The size of the caudal vesicle may be considered on the average about that of a small pea. The scolices or hookless tæniae are formed in the same manner as the others, with the exception of hooks.

THE CÆNURI.

The globular enlarged embryonal vesicle, instead of forming a single scolex anteriorily, forms several, upon various parts of its sur-

face. All the steps of their formation are the same as in the cysticerci. The scolices may be everted by pressure in the same manner. They also have sucking discs and a corona of hooklets, like the preceding. The term caudal vesicle is not appropriate in this condition.

THE ECHINOCOCI.

The embryonic globular vesicle is still more active among these worms than in the preceding two. It is a true maternal vesicle. The prolification is from the internal surface of the mother vesicle. Upon this internal surface there are formed conical nodulations which develope into daughter vesicles, and these united to the mother vesicle by a footstalk, prolificate vesicles after the manner of cænuri. The maternal vesicle varies in size with the growth of the daughter vesicles. The stem remains permanent in E. scoliciparens. In E. attriciparens it separates from the mother vesicle.

When the mother vesicle is cut, the daughter vesicle, upon being squeezed, exhibits the scolices in the usual way i. e. by eversion.

The formation of the suckers and hooks is similar to what holds among the cysticerci and cænuri.* In addition to the three forms of scolex generating cystic worms, there are what may be called scolices without caudal appendage, and those with a band-like appendage. The scolices develope from the six-hooked embryos with all the usual appendages,—suckers and hooks, but the caudal appendage atrophies into the band-like process or disappears.

THE ACTIVE SCOLEX.

The scolices of all the forms of the third stage, having entered, by whatever means, into the intestines of a suitable animal, pass into a state of activity. The head becomes everted, the suckers and hooks change their position,—the hooks projecting forward and outwards. The scolex now fastens by the suckers and hooks upon the intestinal mucous membrane, and casting off his caudal appendage, commences the process of gemmation from the posterior surface. After a time the buds become transversely striated, marking the future divisions into joints, the oldest and most developed being necessarily furthest from the scolex. This process of gemmation comprizes the last stage in the developement.

*All three of these forms of cystic worms, if by any means they become sterile the vesicle is called an Acephalocyst, a structure that has so much puzzled the ingenuity of medical men.

THE STROBILA

matures posteriorly, and as the joints separate they are called proglottides. They contain in their interior eggs for a new generation.

The question has been raised whether a proglottis ought to be called an individual or not.

Each proglottis possesses distinct male and female organs,—fecundates itself—possesses the power of independent motion. It possesses the characteristics of an individual and may be called one.

The formation of joints by this process of budding may go on indefinitely, special circumstances only putting an end to the act. The number of eggs set free from them in the outer world is prodigious, each strobila furnishing many millions. But for the specialized conditions necessary for the development of these worms, they would starve the larger animals by robbing them of their food. A sufficient number of species of cystic and cestoid worms have been found to pass through the preceding metamorphoses, to afford a sufficient proof of the generality of the laws which regulate the development of entozoa.

The liver of the mouse, when affected with Cysticercus fasciolaris, if fed to cats will infest those animals with the Tænia crassicollis.

The Cysticercus pisiformis of hares and rabbits is converted into the Tænia crassiceps of the fox. The Cysticercus tenuicollis becomes the Tænia serrata and the Cysticercus cellulosæ, the Tænia solium. From the Cænurus cerebralis, comes the Tænia cænurus, and from the Echinoccus veterinorum a Tænia echinocci.

The chief difficulty is prosecuting investigations upon those entozoa, is to obtain the right animals to experiment upon. But with that skill, which only comes from experience, *i. e.* observations of a large number of similar facts, it is to be expected that increased facility in artificially propagating these creatures will be acquired.

With adequate knowledge of the history and habits of the entozoa will come an improved method of prophylaxis against them, and skill in their treatment, both of which are yet quite rudimentary.

The Nematoidea still remain in great uncertainty, with regard to their embryology.

The formation of the ovule and zoosperm, and the fecundation of the former by the latter have been observed with much care by Nelson, Meissner, Thomson, Leuckart and others; but the subse-

quent history of the eggs, after impregnation is quite imperfect. The eggs are doubtless cast into the outer world with the excrements, and lie upon dungheaps, in cess pools, in pastures, &c., and as they fall into conditions favorable for development, that process goes on until finally, in the intestines of animals similar to those the parent occupied before, they attain the state of the perfect individual. The discoveries which have already been made, are sufficient to stimulate to fresh exertions, and although the field of investigation is very extensive, still a difficulty is a thing to be *overcome*. Among the parasites infesting marine animals, will be found the greatest difficulty in unravelling the tangled threads of life, owing to the enormous extent at which animal life is maintained, at the expense of animal life, beneath the surface of the sea. When, as has happened within the short space of an hour, four lives have been successively sacrificed to maintain one, by the stronger and larger swallowing a weaker and smaller one, and this in turn another still more defenceless, and so on for four degrees, it is clear that any parasite which should happen to infest the weakest of the prey, will have undergone a good many vicissitudes, and found the conditions for its development greatly complicated. From the fecundation of the egg, to the development of the perfect individual, parasites of different species infesting marine animals are passing through their alimentary canals, and small wonder would it be, if not a single egg ever came to maturity. But so perfect is the adaptation of these creatures to the circumstances in which they are placed, that enough of them pass unharmed through the stages of development, to maintain perpetually the original type, free from all danger of extinction. Similar, but in a less degree, are the conditions upon land. The stronger individuals always maintain themselves at the expense of the weaker, and as they gratify their destructive propensities, render themselves the prey of creatures still more defenceless, whose very insignificance is their best security. Each animal under the motor influence of its will, which in turn is stimulated by necessity, seeks to maintain the requisite conditions, for its own existence at the expense of its neighbours, and is, as it were parasitic to them. Remove those conditions, and at once the animal ceases to be. The entire world of animal life is parasitic to itself, and to the vegetable, which, in turn, depends upon the animal for its supplies,—mutual dependance binds

together animated nature, and this rests upon the material substratum, brute matter with its forces.

Life, a grand totality, perpetually destroyed and perpetually renewed, maintains the grand design in nature, through a succession of conscious and unconscious individuals, ever working out ends, approved by supreme wisdom, though by us at best imperfectly, if at all, discerned.

ON THE APPEARANCE AND DECLINE OF MALARIOUS DISEASE IN THE VALLEY OF THE LOWER GRAND RIVER.

BY ARTHUR HARVEY.

Read before the Hamilton Association.

The appearance in particular localities of peculiar forms of disease forms a highly interesting subject for study and research. Without alluding to the malaria of the Romagna, a district formerly salubrious, or to the encroachments which the yellow fever is yearly making on northern regions, or to other similar cases far from home, we will point to a tract of country, situated close by our doors: the Valley of the Lower Grand River, which, from a healthy settlement, became one of the most unhealthy in America, and has recently recovered its pristine condition. The Grand River, previous to 1834, was allowed to pursue its natural course unimpeded, to Lake Erie; but in that year the Grand River Navigation Company built dams upon the river in several places, making it navigable as far as Brantford. These dams are in some instances so high as to throw back the water for a distance of sixteen or seventeen miles. Previously to their erection, there had not been a single case of fever and ague in the neighbourhood of the river. Neither did this disease manifest itself to any considerable extent for three or four years after their being built. But from 1839 to 1847 malarious disease of the nature above referred to, and of a culiarly malignant character, was universally prevalent, from Brantford downward. It attacked, especially, recent immigrants, whether they came from Europe or from the Lower Provinces. In the tract

between Caledonia Bridge and the dam at that place, a space of but a few yards, there were, in six weeks of 1844, nine deaths from this cause; while the rate of mortality among the population living between Caledonia and Danville was greater than that at New Orleans, from all causes combined. Of late years, however, the number of cases of disease, as well as the intensity of its virus, have diminished. In the small tract near Caledonia, above referred to, not a single death has occurred for the last five years, while on the whole there is, according to the medical gentlemen resident in the Grand River Valley, no healthier part in Canada than this same locality. The prevalence of disease materially retarded the settlement of the country, since who would occupy land where, in spring or fall, to be ill was the rule, to be well the exception? Now, however, the cause being removed, the country may be settled without danger to health, and an almost desert tract of great fertility be made to add its abundant harvest to our already ample annual agricultural produce.

It would appear, at first sight, that the construction of dams on the Grand River could have as little to do with the production of disease as the erection of Tenterden steeple had with the formation of the Goodwin Sands. But, on second thoughts, we may conceive that the river water, "backing up" into, and becoming stagnant in the various creeks, and being comparatively tranquil even in the main channel, would allow of the deposition of putrescent and vegetable substances in places where previously the running water would not have allowed it to remain. Thus we can trace one possible cause of the malaria. But how shall we account for the removal of the cause, while the dams yet remain? One answer, at least, suggests itself to the enquirer. The country near the source of the Grand River and its feeders, as well as along its upper valley, has been rapidly cleared of its timber. The snows there are now quickly melted, and the water resulting therefrom, or from any great downfall of rain, is no longer retained for months among the roots of the trees or in the mossy swamps. It pours down at once in a sudden and violent freshet, which only lasts three or four days, instead of feeding the river and maintaining it at an even height for a month or two. This has a tendency to carry away all floating or deposited vegetable matter into Lake Erie, instead of allowing it to remain and be exposed to the sun's rays; and thus it may now counteract the effect the dams at first produced.

It is matter for reflection, whether the geological characteristics of

the country may not have had something to do with the development of disease to the extraordinary extent, and of the malignant character above referred to.

The rock immediately below the surface is sandstone, and the primary as well as the secondary formation of limestone crops out in the beds of at least one, possibly of several, of the creeks. Between the strata of limestone there is often a deposit of gypsum, sulphate of lime, and, in places, this deposit is so great that it forms the basis of a considerable commerce with Pennsylvania and Ohio, coal being generally brought thence in exchange.

Whether or not the sulphate of lime, although a very insoluble salt, affects the water of the natural springs, this is certain, that they are all impregnated with sulphuretted hydrogen to a very great extent. Indeed the water in the creeks which these springs supply (Boston Creek, McKenzie Creek, Decomèr's Creek, and others) is so strongly charged with the gas, that it offends the senses very perceptibly to travel along their banks. The water in the well of Cayuga gaol is slightly impregnated with the same offensive gas, and there are few, if any, springs in that neighbourhood, in the water of which it cannot be detected, even by the taste. The springs between Cayuga and Canboro' are, in addition, strongly charged with carbonic acid gas (free), which gives it a distinctly pungent flavor, and renders it pleasant and palateable. The wells are here very deep, in some cases sixty feet. The diminished pressure of the atmosphere may have an effect in allowing the carbonic acid gas to escape, which it does, in numerous bubbles, some of which rise as soon as the water is poured out, others gradually form and remain clinging to the side. If a glass of this water be allowed to stand for about twelve hours, all the carbonic acid gas will have escaped, and the sulphuretted hydrogen alone remaining, its characteristic and offensive taste becomes plainly perceptible.

REVIEWS.

Figures and Descriptions of Canadian Organic Remains: Decade III. [Issued by the Geological Survey of Canada.] Montreal, 1858.

It has long been a subject of regret to Canadian and other workers in the field of Palæontology, that the valuable and instructive collections, brought together by the Geological Survey, should be deprived of half

their utility, by remaining without befitting illustration. In our evidence before the Committee of Inquiry, appointed by the House of Assembly, in reference to the survey in the autumn of 1854, we were happy in being able, in conjunction with Sir William Logan and Professor Hall, to urge the earnest consideration of this subject upon the attention of the Committee. The House having afforded to Sir William Logan the means to carry out his long cherished views in regard to this matter, he set to work with his usual energy and discrimination, and subdivided the task amongst those best fitted for its execution. One portion was put into the hands of Mr. Salter, of the Geological Survey of the United Kingdom, a gentleman of the first rank amongst English palæontologists. Professor James Hall, the distinguished author of the "Palæontology of the State of New York," took charge of another portion; and in the person of a Canadian naturalist of rising reputation, Mr. Billings, Sir William Logan has found a most able coadjutor for the accomplishment of a third portion of the work. The assistance of other palæontologists will also be called into request, as the occasion may arise for their more special services; and thus, indeed, in the Number or Decade before us, we find a short but able notice (with illustrations) by Mr. T. R. Jones, of the London Geological Society, on the Bivalve Entomostraca of the Palæozoic Rocks, a department of palæontology which that gentleman has made more especially his own.

Mr. Billings having completed the first portion of the work allotted to him, it has been thought advisable to issue this at once; as, although registered "Decade III.," the part in question is complete within itself, and is altogether distinct from the first and second decades, now on the eve of publication. It comprises, first, a preface or introductory notice by Sir William Logan, in explanation of the character of the work and the plan of publication; secondly, a long and very elaborate essay on the Cystideæ of the Lower Silurian Rocks of Canada, by E. Billings, Esq.; thirdly, a paper on the Asteridæ of the same rocks, also by Mr. Billings; fourthly, a paper on a new genus (Cyclocystoides) of Echinodermata, by Messrs. Salter and Billings; and, lastly, an article on the Bivalve Entomostraca of Canada, by T. R. Jones, Esq., Assistant-Secretary to the Geological Society of London: the whole illustrated by wood engravings, and by eleven plates executed by some of the most eminent lithographers. Of these plates, seven are in illustration of the memoir on the

Cystideæ, by Mr. Billings. To this paper we invite more especially the attention of our readers, as it contains a preliminary dissertation, with many illustrative wood-cuts, in addition to the lithographed plates, on the general history and organization characters of this extinct and interesting type of ancient life. Mr. Billings has thus kept in view the wants of the general student, whilst affording information of a new and purely original character to those already familiar with these details. It would scarcely be fair to our author to quote from this introductory portion of his work, as the necessarily restricted length of our quotations, combined with the absence of explanatory wood-cuts, would fail to convey a just idea of the perspicuous and comprehensive manner in which the various details of the subject are classified and set before the reader. This, however, we regret the less, since, in accordance with the suggestion of Sir William Logan, whilst a certain number of copies of these decades is to be reserved for members of the Legislature, the remaining copies of the issue are to be offered to the general public at a merely nominal cost. By this wise innovation, which we trust to see carried out with regard to the other publications of the Survey, the work will be accessible to all who may desire to possess it; in place of being distributed, as in the case of the Reports already published, amongst a few persons only, and of whom the majority, perhaps, would take but little interest in it.

One of the more interesting points discussed by Mr. Billings in his general review of the structural characters of the lower echinodermata, relates to the so-called ambulacral system in the extinct crinoids. As in these ancient forms, the ambulacral grooves occur only in the arms (apart from the pseudambulacra of the Pentremites and other Blastoidea), the aquiferous and other vessels of the ambulacral system—which in the star-fishes and recent crinoids, issue from the mouth and pass outwards along the grooves—must, in the opinion of Mr. Billings, have entered the body *through special pores situated at the respective bases of the arms.* The truth of this happy suggestion—difficult of general proof, from the imperfection of specimens—has been established by Mr. Billings, and also independently by Professor Huxley, in several species of crinoids belonging to different genera. With regard to the much-disputed position of the oral aperture in the true cystideans, Mr. Billings agrees with De Koninck and others—in opposition to the older view of Von Buch, and to the, perhaps, still general opinion (see Pictet, McCoy, &c.), based on certain analogical

relations to recent crinoids—that the lateral aperture usually regarded as the ovarian orifice, was the true mouth*; and he supports his opinion by a train of argument not easily to be set aside. The series of small triangular valves with which the orifice in question is provided in many species, may be looked upon as the homologues of the "lips" or buccal apparatus of the living Pentacrinus (*P. caput Medusæ*) of the West Indian seas.

In his section on the Lower Silurian species of Canadian cystideæ, Mr. Billings describes nineteen new forms, belonging to his genera, Pleurocystites, Glyptocystites, Comarocystites, Amygdalocystites, Malocystites, Palæocystites, and Ateleocystites. The genus Pleurocystites is a very remarkable one. It is chiefly characterised by the dissimilar structure of the two sides of the body; a series of comparatively large plates covering the dorsal side, whilst the ventral side consists of an open space protected by an integument covered with numerous small plates. The genus, with us, appears to range from the Chazy to the Hudson River group; and geographically from Canada to Wales (Caradoc group), and Bohemia (Barrande's *étage D.*) Six species are enumerated: *P. squamosus* (plates plane or slightly concave; pectinated rhombs, with obtuse angle above); *P. robustus?* (plates concave); *P. filitextus* (pectinated rhombs with acute angle above; plates on ventral side fewer and larger than in *P. squamosus*); *P. elegans; P. exornatus;* and *P. Anticostiensis* (plates probably smooth). *P. elegans* and *P. ornatus* may perhaps prove eventually to be mere varieties of *P. filitextus*. The genus Glyptocystites is characterised chiefly by its cylindrical body, enclosed in four series of plates (= 4 basal + 5 + 5 + 5), some with re-entering angles; and by the presence of *ten or more* pectinated rhombs, a strikingly peculiar character. It ranges from the Chazy to the Trenton group, and comprises the following species: *G. multiporus* (arms 4 + 1, extending down the sides of the body); *G. Logani* (plates with stellar ridges, arms not developed: Trenton): *G. gracilis; G. Forbesi* (plates large and strong, with numerous ridges and striæ: Chazy). Of the genus Comarocystites only one species, *C. punctatus*, has been recognised. It occurs in the Trenton group, and may be readily distinguished by its deeply-concave plates. The basal plates are three in number, succeeded by from

* Except in the genus *Malocystites* (Billings), in which the apical orifice is regarded as the mouth.

eight to eleven irregular rows; the mouth is provided with a valvular apparatus, and there are *free arms*. The genus Amygdalocystites possesses the same plate-formula as Comarocystites, and the mouth is also furnished with a valvular apparatus; but, in addition to other distinguishing characters, the arms are recumbent, and composed of a double in place of a single series of joints. Three species are enumerated. One of these, however, may belong to a distinct genus, and the other two may perhaps be united. They comprise: *A. florealis*, *A. tenuistriatus* (?), and *A. radiatus*. In both Comarocystites and Amygdalocystites the plates are without pores, at least on the unworn external surface. The genus Malocystites has likewise an indefinite number of non-poriferous plates.* The arms are recumbent, and the mouth is nearly at the apex of the cup. Two species are described: *M. Murchisoni*, with eight long and winding arms, and *M. Barrandi*, with two short arms. In the genus named Palæocystites, the plates are numerous and also poriferous, or rather crypto-poriferous, as the pores do not extend directly to the outer surface, but communicate with the interior through the sutures, on the edges of which they open. Nothing is known respecting the arms, orifices, and stem. Three species are enumerated: *P. tenuiradiatus*,† *P. Dawsoni*, and *P. Chapmani*, but their specific characters are necessarily somewhat obscure. Finally, in the genus Ateleocystites, a single species, *A. Huxleyi*, is mentioned. The calyx in this form appears to have, as in Pleurocystites, a dorsal side made up of comparatively few plates, with numerous small plates on the ventral side. In other respects, however, the genus is a very peculiar one, and perhaps referable to a distinct group.

In his enumeration of our Canadian star-fishes, besides two species of McCoy's, or Salter's, Palasterina, Mr. Billings describes several new genera: Stenaster, Petraster, and Tæniaster, amongst ordinary star-fishes, and Edrioaster belonging to the abnormal sessile group. The latter genus was named Cyclaster in Mr. Billings' Report for 1856; but it was subsequently found that the same generic name had been applied in France, just previously, to a new genus of

* As subsequently shown, however, by Mr. Billings, the pores in Comarocystites appear to open out on the sides of the plates at the sutures, as in the genus Palæocystites. May not this be the case, also, with regard to Cryptocrinus (Von Buch), and the other so-called non-poriferous types? E. J. C.

† This is the *Actinocrinus tenuiradiatus* of Hall. The other species appertaining to the different genera enumerated in the text, belong entirely to Mr. Billings.

Echinida. A description (with figures) of the sessile species, *Agelacrinites Dicksoni*, mentioned in the Report for 1856, is also given under this section. Beyond this, we have a detailed description by Messrs. Salter and Billings, of two species of their new and very remarkable genus, Cyclocystoides, a type apparently intermediate between the crinoids and the asteridæ. Finally, the memoir already alluded to, on the Bivalve Entomostraca of Canada, by Mr. T. R. Jones, concludes the volume.

Our brief analysis of the contents of this "Decade" will be sufficient, we trust, to show the rare value of the work thus given to the Canadian student, and to palæontologists generally, by the Director of our Geological Survey. Without doubt, in a scientific point of view, this publication must be regarded as the most important that has yet issued from the Canadian press.

E. J. C.

A Monograph of the Trochilidae, or Humming Birds: By JOHN GOULD, F.R.S., &c. Parts 1 to 16, fol.: 240 plates. London: Published by the author, 20 Broad St., Golden Square.

Mr. Gould has published various splendid ornithological works which rank among the very best for the beauty of their illustrations, whilst they also contain a great deal of accurate and valuable information. Their artistical qualities are truly admirable. The aid they afford to the scientific ornithologist is varied and important. Their great expense, the unavoidable accompaniment of the kind of excellence they possess, limits their usefulness and provokes an occasional grumble from the student of moderate means, as it often excludes them even from respectable public libraries, and makes them the privilege of wealth, instead of the companions of the earnest seekers after the knowledge of nature.

Under these circumstances, in our remote situation, and in a country not yet overflowing with wealth, we should hardly have thought ourselves called upon to notice the latest and perhaps most beautiful and attractive of Mr. Gould's works, had we not enjoyed opportunities in England of examining the splendid collection of preserved specimens of Trochilidae, which was the foundation of the work, as well as that formed by the late excellent Mr. G. Loddiges, with

whom we have often conversed on the characters and peculiarities of this most interesting family, which few have ever studied as he did—and had we not considered that the fine library of our Parliament, which is wisely and liberally made accessible to all who desire to consult it, contains copies of all Mr. Gould's works which are now attainable; whilst the truly beautiful one of which we propose more particularly to speak, has been also placed in the library of the Canadian Institute by one of our fellow citizens, whose liberality and discriminating taste in science and art dignify and adorn the high position which fortune and personal qualities have secured to him. We need scarcely name the Hon. Geo. W. Allan, to whom the Canadian Institute is also in other ways deeply indebted.

The Humming birds long continued to form only a single genus, and when the increasing numbers that from year to year were made known suggested the expediency of subdivision, still for a time only subgenera were proposed, or at least genera were created with great caution. Mr. George Gray was led by his plan to devise the formation of sub-families, and accounting the old genus Trochilus as equivalent to his family TROCHILIDAE, he has enumerated three sub-families *Gryphinae*, or Wedge-tails, *Trochilinae*, or curve-bills, and *Mellisuginae*, or Straight-bills. Under each family are several genera, yet he did not altogether exceed ten, a number which, considering the many species now known, seems very moderate. It must be confessed, however, that his genera have not always a natural aspect, great differences of form being included in the same genus, so that those who had consented to the genera sanctioned by him would be well prepared to listen to the proposals of ornithologists of eminence both on the continent of Europe and in England for yet further sub-division. Prince Bonaparte introduced various genera, and it was well known that Mr. Loddiges, though his great diffidence, and his desire of increasing his knowledge before he gave a decided opinion, had prevented his publishing his views, was prepared to recommend additional ones, and had adopted certain principles respecting the characters proper to be employed. With these materials before him, and having in his hands the finest collection yet formed, Mr. Gould has possibly carried to an extreme the formation of genera. He does not indeed give his readers the means of forming a correct judgment, since his beautiful figures, though accompanied by copious synonymes and a useful description, are without generic and

specific characters. He may probably intend—we hope he does—to give at the conclusion of his work a careful digest of his views and a synopsis of the order, with the requisite characters of genera and species. Whilst waiting for this it is hardly possible for us fairly to discuss the goodness of generic groups of which we have to collect the distinctions for ourselves, or search them out, scattered through various works.

The most obvious character for dividing the Humming birds is perhaps found in the bill, which is straight, slightly curved, sickle-shaped, recurved, and in a few instances furnished with recurved teeth along one portion of both mandibles. Then we have the various forms of the tail, the crests, tufts, and other appendages, the position of the gem feathers, to which we believe Mr. Loddiges attached much importance, and the pretty downy boots or muffs on the feet of many species, besides size, general distribution of colouring, and peculiar habits or instincts. From all these sources we may expect combinations of good and sufficient characters. What is needed is to form the numerous species into natural groups, as many as may be found necessary to express our observations on their resemblance and differences, but taking care that these shall be of real importance, minor distinctions only constituting sections of genera and having no claim to burden science with additional names. When we think we clearly perceive which species must stand together, we then observe carefully whatever is common to them all, and select from what is thus collected concise characters, sufficient to exclude all other species. It would be a manifestly wrong course to contrive characters from abstract principles in relation to the number of genera that must be found in a family, or the points that must be deemed important, since these will differ in different families and are in each case to be learned from observation. Every apparent distinction must not be assumed to be a good generic mark. To combine well is more useful as well as more difficult than to divide. The tendency to make much of small distinctions and to elevate minor sections into genera is the bane of Natural Science, and it is not always understood how much easier a task it is than to find out the true boundaries of natural groups. We have fallen into this train of thought in reflecting on the eighty-eight genera of Trochilidae already given in Mr. Gould's sixteen numbers, containing two hundred and forty species, giving two and a fraction species for each genus, and, as many of

those genera are of some extent, leaving many with only a single species. Many perhaps of these genera we think we perceive to be natural and sound, of many others we have great doubts. When the principles on which they are founded are fully explained every thoughtful naturalist who is interested in this department of science, and who does not fancy that he displays his learning by adopting as many new names as possible, can judge for himself, and after such consideration the best founded opinions will ere long prevail. At present we are willing to extend great candour to Mr. Gould's labours, sensible as we are of the merit which certainly belongs to him. We cannot conclude without reverting to the extreme beauty of the coloured lithographic plates. Some of the loveliest objects in nature are represented with such correctness and spirit, and the metallic lustre of the gem feathers is so successfully imitated, that in order to feel any deficiency the real object must be brought into comparison with its image, and even then we rather wonder how much has been accomplished than feel disposed to complain of what may be wanting. The book is so very beautiful that it is a privilege to be able to look at it. Those who have the means and have any taste for nature should hasten to acquire it. As in several of the best modern works on ornithology and entomology, we have here the flowers drawn and coloured with the same care as the birds, and selected from the flora of the country to which they belong, so that the sources of pleasure and instruction are multiplied, and the botanist has his share in the benefit to be derived from the work. The XVth part contains an exquisite delineation of our own charming Canadian humming bird, with a very interesting account of the author's observations upon it during his recent visit, and of his success in conveying a pair alive to Europe, though unfortunately he failed to prolong their lives there. Mr. Gould's work cannot be known without being admired both for its pre-eminent artistic qualities and for the genuine love and faithful observation of nature which it displays. When it is completed naturalists can with real advantage study the species of Trochilidae; whether they will acquiesce in all Mr. Gould's genera formed or adopted by him, seems to us, with our present means of judging, somewhat doubtful.

W. H.

Annaler for Nordisk Oldkyndighed og Historie. Copenhagen, 1858.

We have received the following notice of a new volume of the Scandinavian Annals of Northern Archæology and History, from a Danish correspondent, and insert it in the form transmitted to us. It furnishes glimpses of a new source of light relative to the Ante-Columbian discovery of America, by the Northmen, from an exceedingly interesting and independent source; and will thus constitute an important supplement to the *Antiquitates Americanæ*, published by the Royal Society of Northern Antiquaries, at Copenhagen, in 1837.

The new volume, now issued after an interval of twenty years, opens with a voluminous and instructive historical and geographical inquiry, by A. F. Mehren, "On the general Geographical Knowledge possessed by the Islamitic Peoples, particularly with respect to the Southern and Northern Coasts of the Hemisphere known to them."

At a time when that flame of science, which had shone so brightly over Greece and Rome, was gradually sinking and expiring, its last rays were preserved in the beginning of the middle ages by a nation hitherto overlooked—the Arabs. This race, after having received from the creative genius of Mohammed a zealous faith and an ordered civil polity, for many centuries occupied the first place among the nations, both for deeds of arms and for careful and high-minded devotion to study; and for a time were at the head of that Europe which was sinking into barbarism. By translations from the Greek, their knowledge nearly reached a classical height, and by their own independent inquiries they acquired well-grounded claims to be reckoned among those nations which have most actively labored in the field of scientific development.

The distinguished French Professor, Reinaud, and the illustrious geographers, Malte-Brun and Lebwel, have particularly directed our attention to the merits of the Arabs in geographical study. The present treatise is a continuation of the labors of those and other scholars.

We have first a classical sketch of the most important Mohammedan geographers, from the eighth to the sixteenth century, according to our era. We have next, separate chapters on the oldest un-

scientific ideas of the Arabians of the Universe; their conceptions of the form of the earth; their mathematical division of the earth; their measurement of the degrees; and the division of the habitable globe into seven regions or climates. Another chapter treats at length of the terrestrial system of seas; the limitation of the earth by the ocean, and the parts of the latter; the Southern Ocean, with its coasts and islands, and the several seas connected therewith; the Eastern Ocean; the Western Ocean, and its connected seas; the Mediterranean, with the Black Sea and the Caspian; the isles in the Western Ocean, and the coasts of the same; and the Northern Lands, known to the Arabs, surrounding the Varenger Sea.

Among the many local names here mentioned as occurring in the works of the Arabian geographers, there is one of especial interest. It affords a supplement to Rafn's *Antiquitates Americanæ*, published by the Society in 1837. The result of th geographical inquiries in this work on the situation of the Northmen's Helluland (Newfoundland), Markland (Nova Scotia), and Vinland (New England), has been taken up, with full approval, by Alexander Humboldt, in his *Kosmos*. A more southern land the Northmen named Hvitramannaland (the land of the White Men); or, Irland it Mikla (Great Ireland). This was supposed by Rafn to be North and South Carolina, Georgia, and Florida. The oldest historian of Iceland, Are Frode, states that his stam-father, Are Marson, came to this land about the year 983, and was baptized there. This same land—*Irland it Mikla, Irlandeh El-Kabirah*—is also mentioned by an Arabian geographer of the 12th century, *Abû-Abdallah Mohammed Edrisi*, who was born in Ceuta, in 1099, and had studied in Cordova. He drew up his work at the desire of Roger II., King of Sicily (1130–1154.) The above geographical name, as well as several other notices of the North, were doubtless derived by the Arabian author from his intercourse with the Northmen, at the court of this sovereign, in Palermo.

It is most interesting to follow the often highly successful identification of the local names mentioned by the Arabian geographers, especially those of several islands in the Western Ocean; places in France and England; and also in Scandinavia, particularly Denmark, where Slesvig is mentioned in a curious manner; and also in Sweden. The same thing applies to Russia. An extract from a voyage in the twelfth century (1132), by *Abû-Abdallah Hamid*, of Granada, gives

an undoubted description of a whale-fishery on the coast of the land Wisu. This, according to the admirable explanation of Frähn, is the locality of the tribe Weg, spoken of in the Russian annals, north of Novgorod, by the White Sea (Bielo Osero), thus identified with a bay of the Arctic Ocean. D. W.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

"RIB-FORMULÆ" IN BRACHIOPODS.

In the specific determination of fossil brachiopods, the palæontologist has to content himself in most instances with external characters. Amongst these may be enumerated the ribs or plaits occurring so frequently on the shell. These plaits, in adult forms, are either constant in their number, or vary only within slight limits. Hence, when present, their number is commonly stated. We suggest, for this purpose, the adoption of a numerical plan or formula, shewing the number of ribs on each side of the sinus, and within it, or upon the mesial fold, where this exists. Thus, when there is a sinus, we may state, RF = $(m|m|m)$, or $(m||m)$; and when there is no sinus, RF = (m). In many forms, of course, RF = 0; and in the forms with an indefinite number of plaits, RF = (00), or (00||00), or $(00|m|00)$. As a general rule, the *Spiriferidæ*, exclusive of the smooth forms, show the rib-formula $(m||m)$; whilst the *Rhynconellidæ* exhibit $(m|m|m)$. The following are some examples:—

Spirifer Niagarensis, Conrad (adult form), RF = (10–15||10–15); *S. sulcatus*, Hisinger, RF = (4–7||4–7); *S. macropleura*, Conrad, RF = (3–4||3–4); *Rhynconella (Hemithyris) nucula*, Sowerby sp., RF = (6–8|3|6–8); *R. formosa*, Hall, RF = (9-10|2–4|9–10). In the latter species, as in many others, the ribs within the sinus are much coarser than those at the sides, a peculiarity which might be indicated by larger or darker figures in the formula.

As the plications on the mesial fold differ usually from those in the sinus, it is perhaps preferable, in these cases, to write the formula in two lines, one above the other; the numbers in the upper line referring to the valve which bears the fold or elevation; and those in the lower line, to that in which the sinus occurs. Thus, in *Atrypa (Rhynconella) increbescens*, Hall, RF = $\left(\frac{4\text{-}6}{4\text{-}6}\middle|\frac{4\text{-}5}{3\text{-}4}\middle|\frac{4\text{-}6}{4\text{-}6}\right)$; or, more simply $\left(4\text{-}6\middle|\frac{4\text{-}5}{3\text{-}4}\middle|4\ 6\right)$.

It is not of course to be supposed, that the method which we have here ventured to suggest to the attention of palæontologists, can be at all times very rigorously applied; but it is thought that, in many instances at least, it will be found a convenient one. The student, for example, would find his labor much facilitated, in the determination of an unknown species by reference to special

works on palæontology, if he were to write in the margin against each species the rib formula as here shewn. The eye would then be able to take up at a glance the relations, in this respect, of the described species to the one under examination —due reference being made to any difference that may exist between young and adult forms.

ARTIFICIAL FORMATION OF CRYSTALLIZED MINERALS.

By the volatilization of metallic fluorides and boracic acid in covered charcoal or clay crucibles, H. Ste.-Clair Deville and H. Caron*, have succeeded in forming, without difficulty, a considerable number of crystallized minerals. Amongst those cited, we may mention: the ruby, sapphire, and other varieties of corundum; chrysoberyll, with the radiating striæ and other characters of the American specimens; gahnite, in beautiful octahedrons; staurolite; zircon; magnetite, &c. In reference to the latter (the magnetic iron ore, which was obtained in the form of long needles, made up of regular octahedrons attached to one another), the authors state that the first formed sesqui-oxide of iron was in this case evidently reduced in part by the high temperature, as confirmed by some of their other experiments.

HYGROSCOPIC PROPERTY OF THE ZEOLITES.

Damour (Annales de Chimie et de Physique: août, 1858) has confirmed his earlier experiments with reference to the property possessed by the various zeolites, to a greater or less extent, of losing a portion of their contained water in a dry atmosphere, and re-absorbing the same under ordinary atmospheric conditions. The water is even re-absorbed, after the mineral has been exposed to a slight degree of artificial heat, amounting in some cases to dull redness.

IRON OXIDES.

The number of *Poggendorff's Annalen* for September, 1858, contains a long and very valuable communication, by Rammelsberg, on the composition of Titaniferous Iron Ore, Red Iron Ore, Martite, and Magnetite. The most important fact, perhaps, shewn in this communication, is the presence of an essential percentage of magnesia in many specimens of these ores, and, more especially, in the octahedral specular-iron of Vesuvius. The following is a condensed translation of the summary given at the close of the Paper:—

(1) The greater number of Titaniferous Irons contain equal atoms of Titanic Acid and Protoxide of Iron (including MnO and MgO).

(2) Magnesia is an essential constituent of all Titaniferous Iron Ores. In the crystallized Titaniferous Iron of Layton, U. S., it amounts to 14 per cent.

(3) According to Mosander's view, Titaniferous Iron Ore consists simply of FeO, TiO^2, with isomorphous replacement of titanate of magnesia (Gastein, Layton); or, otherwise, of the same, in union with sesqui-oxide of iron, mostly in simple proportions.

(4 & 5) The theory of H. Rose, making Titaniferous Iron Ore to consist of the isomorphous sesqui-oxides of iron and titanium, requires the assumption of a

* Journal für Praktische Chemie No. 11, 1858; and Comptes Rendus, t. XLVI, p. 764.

sesqui-oxide of magnesia. Mosander's opinion, consequently, appears to be, by far, the more preferable of the two.

(6) Certain specimens of the granular variety called Iserine, consist of FeO, TiO^2 and Fe^2O^3, $3TiO^2$.

(7) Titaniferous Iron in regular octahedrons is unknown. The amorphous masses and imperfectly-octahedral grains which contain titanium, appear to be mixtures.

(8) Crystallized Magnetic Iron Ore does not contain titanium. It consists of $FeO+Fe^2O^3$.

(9) All the Elba specimens of Specular Iron do not contain titanic acid; but these specimens, as well as the specular iron from Vesuvius, always contain FeO and MgO.

(10) The strongly-magnetic octahedrons (accompanied by rhombohedral iron-glance) from Vesuvius, hitherto looked upon as octahedral sesqui-oxide of iron, contain a large amount of magnesia in some specimens, and protoxide of iron in others. They consist either of Magnetic Iron Ore, partly changed into sesqui-oxide and combined with the isomorphous compound MgO, Fe^2O^3; or, and more probably, the two monoxides are isomorphous with the sesqui-oxide of iron; and this latter is, in itself, dimorphous.

NEW FORM IN THE CRYSTALLIZATION OF HEAVY SPAR.

The museum of the University of Toronto possesses a crystal of Heavy Spar (BaO, SO^3) from Auvergne, in which we have detected the presence of the side polar or brachydome $\frac{4}{3}\check{P}$, hitherto, we believe, unnoticed. The crystal in question is made up principally of the front and side polars $\frac{1}{2}\bar{P}$ and $\check{P}$, with a slight development of the basal form, B; or, in Dana's notation, of $\frac{1}{2}\bar{i}$, $\check{i}$, and o. The new form lies, of course, between $\check{P}$ and B; and it exhibits a series of horizontal striæ parallel to the combination edge of these; or rather, perhaps, parallel to that of $\check{P}$ and $\frac{1}{2}\check{P}$, but the latter form is not present in our crystal. The new form measures, by hand goniometer, 84° 30′ over the base. The striæ prevent the application of the reflective goniometer. Taking the three axes (a, $\bar{a}$, $\check{a}$,) in the protaxial form of Heavy Spar, to be as 1.135 : 1 : 0.8141—axis $\bar{a}$, in the form $\frac{4}{3}\check{P}$, should be to axis a, as 1 : 1.095. The latter (omitting seconds) = cot 42° 24′; making the angle over the base = 84° 48′. The symbol P used in this notation, has no reference to Naumann's symbol. It merely indicates a polar or pyramidal form, of which there are three general kinds: Front polars, $m\bar{P}$; polars, mP and mPm; and side polars, $m\check{P}$. In like manner there are three general kinds of vertical forms: front verticals, $\bar{V}$; verticals, Vm; and side verticals, $\check{V}$. Besides these polars and verticals, we can only have the basal form B, parallel to the horizontal or secondary axes.

E. J. C.

PHYSIOLOGY AND NATURAL HISTORY.

PUBLIC NATURAL HISTORY COLLECTIONS.

The following correspondence has recently passed with the British Chancellor of the Exchequer :—

"SIR,—As one of a body of working Naturalists deeply interested in the fate of the Natural History Collections now in the British Museum, I am requested to transmit for your consideration the enclosed Memorial, which we believe to express the views of a large number of persons engaged in the pursuit of science, although it has not been considered necessary to send it round for general signature. We also understand that it has the full concurrence of Sir William Hooker and others whose official situation prevents their actually joining in it.

"Should you desire to receive any personal explanation of our views we shall be happy to form a deputation to wait upon you at whatever time you may be pleased to appoint.

"I have the honour, &c.,
(Signed) "JOHN LINDLEY."

To the Right Honourable the Chancellor of the Exchequer.

SIR,—The necessity of the removal of the Natural History Departments from the British Museum having been recently brought prominently before the Public, and it being understood that the question of their reorganisation in another locality is under consideration, the undersigned Zoologists and Botanists, professionally or otherwise engaged in the pursuit of Natural Science, feel it their duty to lay before Her Majesty's Government the views they entertain as to the arrangements by which National Collections in Natural History can be the best adapted to the twofold object of the advancement of Science, and its general diffusion among the Public—to show how far the Scientific Museums of the Metropolis and its vicinity, in their present condition, answer these purposes,—and to suggest such modification or additional arrangements as appear requisite to render them more thoroughly efficient.

The Scientific Collections or Museums, whether Zoological or Botanical, required for the objects above stated, may be arranged under the following heads :—

1. A general and comprehensive *Typical* or *Popular Museum*, in which all prominent forms or types of Animals and Plants, recent or fossil, should be so displayed as to give the Public an idea of the vast extent and variety of natural objects, to diffuse a general knowledge of the results obtained by Science in their investigation and classification, and to serve as a general introduction to the Student of Natural History,

2. A complete *Scientific Museum*, in which Collections of all obtainable Animals and plants, and their parts, whether recent or fossil, and of a sufficient number of specimens, should be disposed conveniently for study; and to which should be exclusively attached an appropriate *Library*, or Collection of Books and Illustrations relating to Science, wholly independent of any general Library.

3. A comprehensive *Economic Museum*, in which Economic Products, whether

Zoological or Botanical, with Illustrations of the processes by which they are obtained and applied to use, should be so disposed as best to assist the progress of Commerce and the Arts.

4. Collections of Living Animals and Plants, or *Zoological* and *Botanical Gardens.*

The *Typical* or *Popular Museum,* for the daily use of the general Public, which might be advantageously annexed to the *Scientific Museum,* would require a large building, in a light, airy, and accessible situation. The Collections should be displayed in spacious galleries, in glass cases so closed as to protect them from the dirt and dust raised by the thousands who would visit them; and sufficient room should be allowed within the cases to admit of affixing to the specimens, without confusion, their names, and such Illustrations as are necessary to render them intelligible and instructive to the Student and the general Public.

The *Economic Museums* and *Living Collections* in Botany might be quite independent of the Zoological ones.

The *Scientific Museum,* in Zoology as in Botany, is the most important of all. It is indispensable for the study of Natural Science, although not suited for public exhibition. Without it, the Naturalist cannot examine or arrange the materials for the *Typical, Economic,* or *Living Collections,* so as to convey any useful information to the Public. The specimens, though in need of the same conditions of light, airiness, &c., as, and far more numerous than, those exposed, in the *Typical* or *Popular Museum,* would occupy less space; and they would require a different arrangement, in order that the specimens, might without injury, be frequently taken from their receptacles for examination. This *Scientific Museum,* moreover, would be useless unless an appropriate Library were included in the same building.

The union of the *Zoological* and *Botanical Scientific Museums* in one locality is of no importance. The juxtaposition of each with its corresponding *Living Collection* is desireable, but not necessary—although, in the case of Botany, an extensive Herbarium and Library are indispensable appendages to the Garden and Economic Museum.

The existing Natural History Collections accessible to Men of Science and to the Public, in or near the Metropolis, are the following:—

In Botany—The Kew Herbarium, as a Scientific Collection, is the finest in the world; and its importance is universally acknowledged by Botanists. It has an excellent Scientific Library attached to it; it is admirably situated; and being in proximity with, and under the immediate control of the Head of the Botanic Garden, it supersedes the necessity of a separate Herbarium for the use of that Garden and Museum. But a great part of it is not the property of the State; there is no building permanently appropriated for its accommodation, and it does not include any Collection of Fossil Plants.

The Botanical Collection of the British Museum, consisting chiefly of the Banksian Herbarium, is important, but very imperfect. It is badly situated, on account of the dust and dirt of Great Russell Street: and the want of space in the existing buildings of the British Museum would prevent its extension, even were there an adequate advantage in maintaining, at the cost of the State, two Herbaria or Scientific Botanic Museums so near together as those of London and Kew. The

British Museum also contains a valuable Collection of Fossil Plants, but not more readily available for Science than its Zoological Collections.

There exists no Typical or Popular Botanical Museum for public inspection.

The efficiency of the Botanical Gardens and Museum of Economic Botany at Kew as now organized, and the consequent advantages to Science and the public, are too generally recognized to need any comment on the part of your Memorialists.

In Zoology.—The British Museum contains a magnificent Collection of Recent and Fossil Animals, the property of the State, and intended both for public exhibition and scientific use. But there is no room for its proper display, nor for the provision of the necessary accommodation for its study—still less for the separation of a *Popular Typical* series for public inspection, apart from the great mass of specimens whose importance is appreciated by professed Naturalists. And, in the attempt to combine the two, the Public are only dazzled and confused by the multiplicity of unexplained objects, densely crowded together on the shelves and cases; the man of science is, for three days in the week, deprived of the opportunity of real study; and the specimens themselves suffer severely from the dust and dirt of the locality, increased manifold by the tread of the crowds who pass through the galleries on Public Days,—the necessity of access to the specimens on other days preventing their being arranged in hermetically closed cases.

A Museum of Economic Zoology has been commenced at South Kensington.

There is an unrivalled Zoological Garden or living Collection, well situated in the Regent's Park, but not the property of the State, nor receiving any other than indirect assistance, in the terms on which its site is granted.

The measures which your Memorialists would respectfully urge upon the consideration of Her Majesty's Government, with a view to rendering the Collections really available for the purposes for which they are intended, are the following:—

That the Zoological Collections at present existing in the British Museum be separated into two distinct Collections,—the one to form a *Typical* or *Popular Museum*, the other to constitute the basis of a complete *Scientific Museum*.

These Museums might be lodged in one and the same building, and be under one direction, provided they were arranged in such a manner as to be separately accessible; so that the one would always be open to the Public, the other to the man of science, or any person seeking for special information. This arrangement would involve no more trouble, and would be as little expensive as any other which could answer its double purpose, as the *Typical* or *Popular Museum* might at once be made almost complete, and would require but very slight, if any, additions.

In fact, the plan proposed is only a further development of the system according to which the Entomological, Conchological, and Osteological Collections in the British Museum are already worked.

That an appropriate *Zoological Library* be attached to the *Scientific Museum*, totally independent of the Zoological portion of the Library of the British Museum, which, in the opinion of your Memorialists, is inseparable from the General Library.

That the *Scientific Zoological Museum* and *Library* be placed under one head

directly responsible to one of her Majesty's Ministers, or under an organization similar to that which is practically found so efficient in regard to Botany.

That the *Museum of Economic Zoology* at South Kensington be further developed.

Your Memorialists recommend that the whole of the Kew Herbarium become the property of, and be maintained by, the State, as is now the case with a portion of it—that the Banksian Herbarium and the Fossil Plants be transferred to it from the British Museum—and that a permanent building be provided for the accommodation at Kew of the Scientific Museum of Botany so formed.

This consolidation of the Herbaria of Kew with those of the British Museum would afford the means of including in the *Botanical Scientific Museum* a Geographical Botanical Collection for the illustration of the Colonial Vegetation of the British Empire, which, considering the extreme importance of vegetable products to the commerce of this country, your Memorialists are convinced would be felt to be a great advantage.

Your Memorialists recommend further, that in place of the Banksian Herbarium and other miscellaneous Botanical Collections now in the British Museum and closed to the public, a *Typical* or *Popular Museum* of Botany be formed in the same building as that proposed for the *Typical* or *Popular Museum* of Zoology, and, like it, be open daily to the Public.

Such a Collection would require no great space; it would be inexpensive, besides being in the highest degree instructive; and, like the *Typical* or *Popular Zoological Collection*, it would be of the greatest value to the public, and to the Teachers and Students of the Metropolitan Colleges.

That the *Botanical Scientific Museum* and its *Library*, the *Museum of Economic Botany* and the *Botanic Garden*, remain, as at present, under one head, directly responsible to one of her Majesty's Ministers.

The undersigned Memorialists, consisting wholly of Zoologists and Botanists, have offered no suggestion respecting the very valuable Mineralogical Collection in the British Museum, although aware that, in case it should be resolved that the Natural History Collections generally should be removed to another locality, the disposal of the Minerals also will probably come under consideration.

November 18, 1858.

George Bentham, V.P.L.S.

George Busk, F.R.S. and Z.S., Professor of Comparative Anatomy and Physiology to the Royal College of Surgeons of England.

William B. Carpenter, M.D., F.R.S., and Z.S., Registrar of the University of London.

Chas. Darwin, F.R.S., L.S., and G.S.

W. H. Harvey, M.D., F.R.S. and Z.S., &c., Professor of Botany, University of Dublin.

Arthur Henfrey, F.R.S., L.S., &c., Professor of Botany, King's College, London.

J. S. Henslow, F.L,S. and G.S., Professor of Botany in the University of Cambridge.

Thomas Huxley, F.R.S., Professor of Natural History, Government School of Mines, Jermyn Street.

John Lindley, F.R.S. and L.S., Professor of Botany in University College London.

MISCELLANEOUS.

DR. GEORGE PEACOCK.

Among recent blanks in the circle of English Science and Literature, the death of the late Dean of Ely is one which cannot fail to be deeply felt by all who appreciate knowledge, learning, and the practical power of a cultivated intellect in their less showy, but most substantial forms. We abridge from a biographical sketch in the pages of the Athenæum some notes regarding the career of this ditinguished English mathematician, who has contributed in some very important respects to the advancement of his favorite studies, and their practical bearing on the progress of his age.

Dr. George Peacock was a student of Trinity College, Cambridge, and took his B.A. degree at that University in 1813, with peculiar distinctions, Sir John Herschel being the senior wrangler of that year, and George Peacock the second. One familiar with the Cambridge system, and with the recent history of the science in which he so distinguished himself, thus sketches the ingenuous student in his earlier contact with the formal tests and stimulants of University competitions for honors:—Peacock's mind was, in some respects, differently framed from those of the young men who usually distinguish themselves. The University examinations cultivate two kinds of power: acquisition of knowledge, called *bookwork*, and solution of such applications as can be done by good heads in a few minutes, dignified by the name of *problems*. It is of course impossible in the hurried examinations, to try how the student stands, upon points which would give a finished mathematician an hour or two of thought. Accordingly, those young men, however deeply they may think, who do not possess, or cannot acquire, a certain trick which we call *problem-knack*, cannot show themselves among the highest wranglers, unless their amount of digested reading be very great indeed. We once knew a young aspirant who was in despair at finding that comrades, to whom he used to explain first principles and elucidate difficulties, could *do problems* much faster and better than himself: by practice, however, he caught problem-knack, and took a high degree. Peacock was on of those who, as stories ran in our undergraduate day, "never did a single problem." A sarcastic review of Cambridge men and things, which made some noise at the time. reckoned him up thus:—"He has read three times as much mathematics as any man in Europe but has not a spark of originality." He lived to shew the highest and the rarest originality of speculative thought: the power of seeing a whole science as it is to be, and lending aid in placing it upon its proper basis. Hundreds of those who would have beaten him hollow at Cambridge problems are wholly unfit to attempt

the formation of any the least idea of the scope and meaning of his works on algebra.

At the time when Peacock took his degree, the public mind of Cambridge was stirred on the question of the University mathematics. The English school, following Newton's notation of fluxions, had almost lost the power of reading the continental treatise. There were two undergraduates, Herschel and Peacock, who were well read, in the foreign writers. There was a third, Babbage, who, without the same depth of reading, had trained a rare genius for analysis in the same school. A fourth was Maul (afterwards Judge), who might have been among the first of mathematicians, if he had chosen that career. Woodhouse, an older man, had opened the way by a treatise in 1803. The younger men determined to act in concert, for the introduction of the continential mathematics. They formed an *Analytical Society*, and published a volume of Memoirs in 1813. They translated the work of Lacroix on the Differential Calculus, and prepared a volume of examples, of which Peacock compiled the larger part, in a manner which showed very extraordinary reading for a man of his age. This translation, and these examples, carried the day: and Peacock, when he became Moderator in 1817, completed the victory by introducing the modern language and notation into the public examinations. His colleague did not join him in the alteration; and the Moderators of 1818 returned to the old system. Peacock was again Moderator in 1819 with a colleague of his own cabal (Mr. Gwatkin), and from that year the change was fully accepted. There are those who like to know the precise time and manner of all things: let them stand informed that the official recognition of the continental school of mathematicians at Cambridge dates from nine o'clock in the morning of Monday, January 13, 1817, when Peacock put into the hands of each candidate for honours a printed paper, the fourth question of which stands thus:—

"Find the integral of $\frac{dx}{1 + x^3}$."

Peacock became a tutor of the college, and gained a high reputation as a teacher and as a guardian of his pupils. His temper was kind, his knowledge of the world, and especially of the young world, was ample, and his manner was pleasant. Some amusing peculiarities of idiom, brought from the north, and—to speak the truth—a peculiar physiognomy, which would have been visited in vengeance upon a disagreeable and *donnish* superior, were but additions to his popularity. He had a strong, active, practical turn for administration, and college affairs prevented him from making science his whole object, though he was always a student, not only of mathematics, but of literature. In 1826 appeared in the Encyclopædia Metropolitana his article on the history of Arithmetic, the most learned essay on the subject which exists. He was at the same time continually occupied with thought on the nature and first principles of algebra. A syllubus of Trigonometry in which he fixed—for Cambridge, at least—the character of the fundamental forms, which had been fluctuating between the old and new, was a slight digression. We cannot undertake to describe in full what he did for algebra. That science, like logic, ought to be purely formal: up to our own day it has been troubled with apparent exceptions, arising from insufficient amount of generality

in its fundamental definitions. Peacock concentrated what had been done towards amendment, and augmented it into a system, imperfect indeed, but presented in such a manner as to show what was wanted, and what are the rational principles on which the supply of the want must be attempted. This work was published in 1830; and in 1842-45 appeared another digestion of the subject into two volumes, the first containing solely arithmetical algebra,—the best work on this preliminary which has appeared,—the second containing symbolical algebra. These works show that thought which the mathematical *workman* scorns, and the mathmatical philosopher prizes. A report on the recent progress of Analysis, made to the British Association in 1833, contains an acute discussion of difficulties, and shows that the wide reading of the author of the Examples was continued down to the day in which he wrote.

All Peacock's works have thought, labour, and finish. In none are these more conspicious than in his life of Dr. Young (1855), and his collection of Young's miscellaneous works, in three volumes. Young was a man of very varied pursuits and knowledge. These volumes occupied Peacock during many years; and are a monument both to Young and his editor which is worth many a statue. Dr. Peacock's last writing was a collection of short, pithy, and effective answers to Lord Overstone's questions on the decimal coinage. He was a steady and thorough-going supporter of the system approved by the House of Commons, called the *pound-and mil* system: and he had, as usual, read deeply and thought long on the subject, both in writing the history of arithmetic, and as one of the Royal Commission on weights and measures.

Peacock steadily upheld the liberal side in politics during the times of greatest discouragement; and, considering how powerful an influence he had exercised in Cambridge, it would not have surprised the world if he had received some speedy advancement. But our liberal statesmen, though rather conspicious than otherwise for their early attention to family claims, have always appeared to think that support given to their principles is but a secondary ground of patronage. Accordingly, it was not till 1839, or thereabouts, that Peacock was made Dean of Ely. His attention was new especially directed to his new station: and the cathedral, the town, and the surrounding country bear marks of his zeal and of his skill in the management of men. For many years previous to his death he had to contend with ill health, frequently acute in its symptoms. His writings on University reform, and his labours on the Cambridge Commission, are perhaps the things by which he is best known to the world at large. He held the Lowndean Professorship for many years, and he attempted to lecture. But there was no audience for a philosophical mathematician in the University of book-work and problems. Dr. Peacock was fully aware of the tendency of the existing system, the end of which is, in nine out of ten, examination and nothing beyond. He is lost to Cambridge at the time when Cambridge most wants him.

Dr. Peacock exercised grest influence over his contemporaries by soundness of judgement, extent of knowledge, and suavity of manners. His various qualities and attainments were perfectly blended, and lent force to each other: the combination was one of power; for he was a man of business, of science, of learning, and of character.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The admirable and comprehensive Presidential Address delivered by Professor Owen, at the opening meeting of the British Association in August last, has been delayed appearing in our pages,—along with an abstract which we had prepared of the papers read in the sections,—by the space claimed for original communications. But the Address contains such a valuable resumé of work accomplished in the various departments of science in recent years, as our readers will still be glad to have placed on record here; and we, accordingly, find room for it, with some unimportant omissions in our Scientific Appendix:—

THE PRESIDENT'S ADDRESS.

We are here met, in this our twenty-eighth annual assembly, to continue the aim of the Association, which is the promotion of Science, or the knowledge of the laws of Nature; whereby we acquire a dominion over nature, and are thereby able so to apply her powers as to advance the well-being of society and exalt the condition of mankind. It is no light matter, therefore, the work that we are here assembled to do. God has given to man a capacity to discover and comprehend the laws by which His universe is governed; and man is impelled by a healthy and natural impulse to exercise the faculties by which that knowledge can be acquired. Agreeably with the relations which have been instituted between our finite faculties and phenomena that affect them, we arrive at demonstrations and convictions which are the most certain that our present state of being can have or act upon. Nor let any one, against whose prepossessions a scientific truth may jar, confound such demonstrations with the speculative philosophies condemned by the Apostle; or ascribe to arrogant intellect, soaring to regions of forbidden mysteries, the acquisition of such truths as have been or may be established by patient and inductive research. For the most part, the discoverer has been so placed by circumstances,—rather than by predetermined selection,—as to have his work of investigation allotted to him as his daily duty; in the fulfilment of which he is brought face to face with phenomena into which he must inquire, and the result of which inquiry he must faithfully impart. The advance of natural as of moral truth has been and is progressive: but it has pleased the Author of all truth to vary the fashion of the imparting of such parcels thereof as He has allotted, from time to time, for the behoof and guidance of mankind. Those who are privileged with the faculties of discovery are, therefore, to be regarded as pre-ordained instruments in making known the power of God, without a knowledge of which, as well as of Scripture, we are told that we shall err. Great and marvellous have been the manifestations of this power imparted to us of late times, not only in respect of the shape, motions and solar relations of the earth, but also of its age and inhabitants. In regard to the period during which the globe allotted to man has revolved in its orbit, present evidence strains the mind to grasp such sum of past time with an effort like that by which it tries to realize the space dividing that orbit from the fixed stars and remoter nebulæ. Yet, during all those eras that have passed since the Cambrian rocks were deposited which bear the impressed record of creative power, as it was then manifested, we know, through the inter-

preters of these "writings on stone," that the earth was vivified by the sun's light and heat, was fertilized by refreshing showers and washed by tidal waves. No stagnation has been permitted to air or ocean. The vast body of waters not only moved, as a whole, in orderly oscillations, regulated, as now, by sun and moon, but were rippled and agitated here and there successively by winds and storms. The atmosphere was healthily influenced by its horizontal currents, and by ever-varying clouds and vapours rising, condensing, dissolving, and falling in endless vertical circulation. With these conditions of life, we know that life itself has been enjoyed throughout the same countless thousands of years; and that with life, from the beginning, there has been death. The earliest testimony of the living thing, whether shell, crust, or coral in the oldest fossiliferous rock, is at the same time proof that it died. It has further been given us to know, that not only the individual but the species perishes; that as death is balanced by generation, so extinction has been concomitant with creative power, which has continued to provide a succession of species; and furthermore, that as regards the varying forms of life which this planet has witnessed, there has been "an advance and progress in the main." Geology demonstrates that the creative force has not deserted this earth during any of her epochs of time; and that in respect to no one class of animals has the manifestation of that force been limited to one epoch. Not a species of fish that now lives, but has come into being during a comparatively recent period: the existing species were preceded by other species; and these again by others still more different from the present. No existing genus of fishes can be traced back beyond a moiety of known creative time. Two entire orders (Cycloids and Stenoids) have come into being, and have almost superseded two other orders (Ganoids and Placoids), since the newest or latest of the secondary formations of the earth's crust. Species after species of land animals, order after order of air-breathing reptiles, have succeeded each other; creation ever compensating for extinction. The successive passing away of air-breathing species may have been as little due to exceptional violence, and as much to natural law, as in the case of marine plants and animals. It is true, indeed, that every part of the earth's surface has been submerged; but successively, and for long periods. Of the present dry land different natural continents have different Faunæ and Floræ; and the fossil remains of the plants and animals of these continents respectively show that they possessed the same peculiar characters, or characteristic *facies*, during periods extending far beyond the utmost limits of human history. Such is a brief summary of facts most nearly interesting us, which have been demonstratively made known respecting our earth and its inhabitants. And when we reflect at how late and in how brief a period of historical time the acquisition of such knowledge has been permitted, we must feel that vast as it seems, it may be but a very small part of the patrimony of truth destined for the possession of future generations.

In reviewing the nature and results of our proceedings during the last twenty-seven years, and the aims and objects of our Association, it seems as if we are realizing the grand Philosophical Dream or Prefigurative Vision of Francis Bacon, which he has recounted in his 'New Atlantis.' In this noble Parable the Father of Modern Science imagines an Institution which he calls "Solomon's House," and informs us by the mouth of one of its members, that "The end of its Foundation is

the Knowledge of Causes and Secret Motions of Things; and enlarging of the bounds of Human Empire to the effecting of all things possible." As one important means of effecting the great aims of Bacon's "six days' college," certain of its members were deputed, as "merchants of light," to make "circuits or visits of divers principal cities of the kingdom." This latter feature of the Baconian organization is the chief characteristic of the "British Association;" but we have striven to carry out other aims of the 'New Atlantis,' such as the systematic summaries of the results of different branches of science, of which our published volumes of 'Reports' are evidence; and we have likewise realized, in some measure, the idea of the "Mathematical House" in our establishment at Kew. The national and private observatories, the Royal and other Scientific Societies, the British Museum, the Zoological, Botanical, and Horticultural Gardens, combine in our day to realize that which Bacon foresaw in distant perspective. Great, beyond all anticipation, have been the results of this organization, and of the application of the inductive methods of interrogating nature. The universal law of gravitation, the circulation of the blood, the analogous course of the magnetic influence, which may be said to vivify the earth, permitting no atom of its most solid constituents to stagnate in total rest; the development and progress of Chemistry, Geology, Palæontology; the inventions and practical applications of Gas, the Steam-engine, Photography, Telegraphy: such, in the few centuries since Bacon wrote, have been the rewards of the faithful followers of his rules of research. After dwelling on the importance of direct observation as illustrated in the history of Astronomy, he referred to the discovery of Galileo, the application of his discovery by Kepler and Horrocks, and continued—Without stopping to trace the concurrent progress of the science of motion, of which the true foundations were laid, in Bacon's time, by Galileo, it will serve here to state that the foundations were laid and the materials gathered for the establishment by a master-mind, supreme in vigour of thought and mathematical resource, of the grandest generalization ever promulgated by science—that of the universal gravitation of matter according to the law of the inverse square of the distance. The same century in which the 'Thema Cœli' of Lord Verulam and the 'Nuncius Sidereus' of Galileo saw the light, was glorified by the publication of the 'Philosophiæ Naturalis Principia Mathematica' of Newton. Has time, it may be asked, in any way affected the great result of that masterpiece of human intellect? These are signs that even Newton's axiom is not exempt from the restless law of progress. The mode of expressing the law of gravitation as being "in the inverse proportion of the square of the distances" involves the idea that the force emanating from or exercised by the sun must become more feeble in proportion to the increased spherical surface over which it is diffused. So indeed it was expressly understood by Halley. Prof. Whewell, the ablest historian of Natural Science, has remarked that "future discoveries may make gravitation a case of some wider law, and may disclose something of the mode in which it operates." The difficulty, indeed, of conceiving a force acting through nothing from body to body has of late made itself felt; and more especially since Meyer of Heilbronn first clearly expressed the principle of the "conservation of force." Newton, though apprehending the necessity of a medium by which the force of gravitation should be conveyed from one body to another, yet appears not to have possessed such an idea of the uncreateability

and indestructibility of force as that which, now possessed by minds of the highest order, seems to some of them to be incompatible with the terms in which Newton enunciated his great law, viz., of matter attracting matter with a force which varies inversely as the square of the distance. The progress of knowledge of another form of all-pervading force, which we call, from its most notable effect on one of the senses, "Light," has not been less remarkable than that of gravitation. Galileo's discovery of Jupiter's satellites supplied Römer with the phenomena whence he was able to measure, in 1676, the velocity of light. Descartes, in his theory of the rainbow, referred the different colours to the different amount of refraction, and made a near approximation to Newton's capital discovery of the different colours entering into the composition of the luminous ray, and of their different refrangibility. Hook and Huyghens, about the same period, had entered upon explanations of the phenomena of light conceived as due to the undulations of an ether, propagated from the luminous point spherically, like those of sound. Newton, whilst admitting that such undulations or vibrations of an ether would explain certain phenomena, adopted the hypothesis of emission as most convenient for the mathematical propositions relative to light. The discoveries of achromatism, of the laws of double refraction, of polarization circular and elliptical, and of dipolarization rapidly followed: the latter advances of optics, realizing more than Bacon conceived might flow from the labours of the "Perspective House," are associated with and have shed lustre on the names of Dollond, Young, Malus, Fresnel, Biot, Arago, Brewster, Stokes, Jamin, and others. Some of the natural sciences, as we now comprehend them, had not germinated in Bacon's time. Chemistry was then alchemy; Geology and Palæontology were undreamt of: but Magnetism and Electricity had began to be observed, and their phenomena compared, and defined, by a contemporary of Bacon in a way that claims to be regarded as the first step towards a scientific knowledge of those powers. It is true that, before Gilbert, ('De Magnete,' 1600), the magnet was known to attract iron, and the great practical application of magnetized iron—the mariner's compass—had been invented, and for many years before Bacon's time had guided the barks of navigators through trackless seas. Gilbert, to whom the name "electricity" is due, observed that that force attracted light bodies, whereas the magnetic force attracted iron only. About a century later the phenomena of repulsion as well as of attraction of light bodies by electric substances were noticed: and Dufay, in 1733, enunciated the principle, that "electric bodies attract all those that are not so, and repel them as soon as they are become electric by the vicinity of the electric body." The conduction of electric force, and the different behaviour of bodies in contact with the electric, leading to their division, by Desguliers, into conductors and non-conductors, next followed. The two kinds of electricity, at first by Dufay, their definer, called "vitreous" and "resinous,"—afterwards, by Franklin, "positive" and "negative," formed an important step, which led to a brilliant series of experiments and discoveries, with nventions, such as the Leyden jar, for intensifying the electric shock. The discovery of the instantaneous transmission of electricity through an extent of not less than 12,000 feet, by Bishop Watson, together with that of the electric state of the clouds, and of the power of drawing off such electricity by pointed bodies, as shown by Franklin, was a brilliant beginning of the application of this science to the well-

being and needs of mankind. Magnetism has been studied with two aims: the one, to note the numerical relations of its activity to time and space, both in respect of its direction and intensity; the other, to penetrate the mystery of the nature of the magnetic force. In reference to the first aim, my estimable predecessor adverted, last year, to the fact, that it was in the committee-rooms of the British Association that the first step was taken towards that great magnetic organization which has since borne so much fruit. Thereby it has been determined that there are periodical changes of the magnetic elements depending on the hour of the day, the season of the year, and, what seemed strange, intervals of about eleven years. Also, that besides these regular changes there were others of a more abrupt and seemingly irregular character—Humboldt's "magnetic storms,"—which occur simultaneously at distant parts of the earth's surface. Major-General Sabine, than whom no individual has done more in this field of research since Halley first attempted "to explain the change in the variation of the magnetic needle," has proved that the magnetic storms observed diurnal, annual, and undecennial periods. But with what phase or phenomenon of earthly and heavenly bodies, it may be asked, has the magnetic period of eleven years to do! The coincidence which points to, if it does not give, the answer, is one of the most remarkable, unexpected, and encouraging to patient observers. For thirty years a German astronomer, Schwabe, had set himself the task of daily observing and recording the appearance of the sun's disc, in which time he found the spots passed through periodic phases of increase and decrease, the length of the period being about eleven years. A comparison of the independent evidence of the astronomer and magnetic observer has shown that the undecennial magnetic period coincides both in its duration and in its epochs of maximum and minimum with the same period observed in the solar spots.

A few weeks ago, during a visit of inspection to our establishment at Kew, I observed the succesful operation of the photo-heliographic apparatus in depicting the solar spots as they then appeared. The continued regular record of the macular state of the sun's surface, with the concurrent magnetic observations now established over many distant points of the earth's surface, will ere long establish the full significance and value of the remarkable, and, in reference of the observers, undesigned, coincidence above mentioned. Not to trespass on your patience by tracing the progress of Magnetism from Gilbert to Oersted, I cannot but advert to the time, 1807, when the latter tried to discover whether electricity in its most latent state had any effect on the magnet, and to his great result, in 1820, that the conducting wire of a voltaic circuit acts upon a magnetic needle, so that the latter tends to place itself at right angles to the wire. Ampère, moreover, succeeded, by means of a delicate apparatus, in demonstrating that the voltaic wire was affected by the action of the earth itself as a magnet. In short, the generalization was established, and with a rapidity unexampled, regard being had to its greatness, that *magnetism and electricity are but different effects of one common cause.* This has proved the first step to still grander abstractions,—to that which conceives the reduction of all species of imponderable fluids of the chemistry of our student days, together with gravitation, chemicity, and neuricity, to interchangeable modes of action of one and the same all-pervading life-essence. Galvani arranged the parts of a recently-mutilated frog so as to bring a nerve in contact with the exter-

nal surface of a muscle, when a contradiction of the muscle ensued. In this suggestive experiment the Italian philosopher, who thereby initiated the inductive inquiry into the relation of nerve force to electric force, concluded that the contraction was a necessary consequence of the passage of electricity from one surface to the other by means of the nerve. He supposed that the electricity was secreted by the brain, and transmitted by the nerves to different parts of the body, the muscles serving as reservoirs of the electricity. Volta made a further step by showing that, under the conditions or arrangements of Galvani's experiments, the muscle would contract, whether the electric current had its origin in the animal body, or from a source external to that body, Galvani erred in too exclusive a reference of the electric force producing the contraction to the brain of the animal: Volta in excluding the origin of the electric force from the animal body altogether. The determination of "the true" and "the constant" in these recondite phenomena, has been mainly helped on by the persevering and ingenious experimental researches of Mateucci and Du Bois Reymond. The latter has shown that any point of the surface of a muscle is positive in relation to any point of the divided or transverse section of the same muscle; and that any point of the surface of a nerve is positive in relation to any point of the divided or transverse section of the same nerve. Mr. Baxter in still more recent researches, has deduced important conclusions on the origin of the muscular and nerve currents, as being due to the polarized condition of the nerve or muscular fibre, and the relation of that condition to changes which occur during nutrition. From the present state of neuro-electricity, it may be concluded that nerve force is not identical with electric force, but that it may be another mode of motion of the same common force: it is certainly a polar force, and perhaps the highest form of polar force:—

> A motion which may change, but cannot die:
> An image of some bright eternity.

The present tendency of the higher generalizations of Chemistry seems to be towards a reduction of the number of those bodies which are called "elementary"; it begins to be suspected that certain groups of so-called chemical elements are but modified forms of one another; that such groups as chlorine, iodine, bromine, fluorine, and as sulphur, selenium, phosphorus, boron, may be but allotropic forms of some one element. Organic Chemistry becomes simplified as it expands; and its growth has of late proceeded, through the labours of Hofmann, Berthelot and others, with unexampled rapidity. An important series of alcohols and their derivatives, from amylic alcohol downwards; as extensive a series of others including those which give their peculiar flavor to our choicest fruits; the formic, butyric, succinic, lactic, and other acids, together with other important organic bodies, are now capable of artificial formation from their elements, and the old barrier dividing organic from inorganic bodies is broken down. To the power which mankind may ultimately exercise through the light of synthesis, who may presume to set limits? Already natural processes can be more economically replaced by artificial ones in the formation ot a few organic compounds, the "valerianic acid," for example. It is impossible to foresee the extent to which Chemistry may not ultimately, in the production of things needful, supersede the present vital agencies of nature, "by laying under contribution the accumulated forces of

past ages, which would thus enable us to obtain in a small manufactory, and in a few days, effects which can be realized from present natural agencies only when they are exerted upon vast areas of land, and through considerable periods of time." Since Niepce, Herschel, Fox, Talbot, and Daguerre laid the foundations of Photography, year by year some improvement is made,—some advance achieved, in this most subtle application of combined discoveries in Photicity, Electricity, Chemistry, and Magnetism. Last year, M. Poitevin's production of plates in relief, for the purpose of engraving by the action of light alone, was cited as the latest marvel of Photography. This year has witnessed photographic printing in carbon by M. Pretschi. Prof. Owen continued by alluding to the application of photography for obtaining views of the moon, of the planets, of scientific and other phenomena. After referring to the discoveries in Electro-magnetism, the President continued: Remote as such profound conceptions and subtle trains of thought seem to be from the needs of everyday life, the most astounding of the practical augmentation of man's power has sprung out of them. 'Nothing might seem less promising of profit than Oersted's painfully-pursued experiments, with his little magnets, voltaic pile, and bits of copper wire. Yet out of these has sprung the electric telegraph! Oersted himself saw such an application of his convertibility of electricity into magnetism, and made arrangements for testing that application to the instantaneous communication of signs through distances of a few miles. The resources of inventive genius have made it practicable for all distances; as we have lately seen in the submergence and working of the electro-magnetic cord connecting the Old and New World. On the 6th of August 1858, the laying down of upwards of 2,000 nautical miles of the telegraphic cord, connecting Newfoundland and Ireland, was successfully completed; and on that day a message of thirty-one words was transmitted in thirty-five minutes, along the sinuosities of the submerged hills and valleys forming the bed of the great Atlantic. This first message expressed—"Glory to God in the highest: on Earth Peace; Good will towards Men." Never since the foundations of the world were laid could it be more truly said, "The depths of the sea praise Him!" More remains to be done before the far-stretching engine can be got into full working order; but the capital fact, viz., the practibility of bringing America into electrical communication with Europe has been demonstrated; consequently, a like power of instantaneous interchange of thought between the civilized inhabitants of every part of the globe becomes only a question of time. The powers and benefits thence to ensue for the human race can be but dimly and inadequately foreseen. After referring to the labours of Ray, Linnæus, Jussieu, Buffon, and Cuvier, he said: To perfect the natural system of plants has been the great aim of botanists since Jussieu. To obtain the same true insight into the relations of animals has stimulated the labours of zoologists since the writings of Cuvier. To that great man appertains the merit of having systematically pursued and applied anatomical researches to the discovery of the true system of distribution of the animal kingdom; nor, until the Cuvierian amount of zootomical science had been gained, could the value and importance of Aristotle's 'History of Animals' be appreciated. There is no similar instance, in the history of Science of the well-lit torch gradually growing dimmer and smouldering through so many

generations and centuries before it was again fanned into brightness, and a clear view regained, both of the extent of ancient discovery, and of the true course to be pursued by modern research. Rapid and right has been the progress of Zoology since that resumption. Not only has the structure of the animal been investigated, even to the minute characteristics of each tissue, but the mode of formation of such constituents of organs, and of the organs themselves, has been pursued from the germ, bud, or egg, onward to maturity and decay. To the observation of outward characters is now added that of inward organization and developmental change, and Zootomy, Histology and Embryology combine their results in forming an adequate and lasting basis for the higher axioms and generalizations of Zoology properly so called. Three principles, of the common ground of which we may ultimately obtain a clearer insight, are now recognized to have governed the construction of animals:—unity of plan, vegetative repetition, and fitness for purpose. The independent series of researches by which students of the articulate animals have seen, in the organs performing the functions of jaws and limbs of varied powers, the same or homotypal elements of a series of like segments constituting the entire body, and by which students of the vertebrate animals have been led to the conclusion, that the maxillary, mandibular, hyoid, scapular, costal and pelvic arches, and their appendages sometimes forming limbs of varied powers, are also modified elements of a series of essentially similar vertebral segments,—mutually corroborate their respective conclusions. It is not probable that a principle which is true for *Articulata* should be false for *Vertebrata:* the less probable since the determination of homologous parts becomes the more possible and sure in the ratio of the perfection of the organization.

After pointing out the distinction between Affinity, which indicates an intimate resemblance, and Analogy, which indicates a remote one, he continued—The study of homologous parts in a single system of organs—the bones—has mainly led to the recognition of the plan or archetype of the highest primary group of animals, the Vertebrata. The next step of importance will be to determine the homologous parts of the nervous system, of the muscular system, of the respiratory and vascular system, and of the digestive, secretory and generative organs in the same primary group or province. I think it of more importance to settle the homologies of the parts of a group of animals constructed on the same general plan, than to speculate on such relations of parts of animals constructed on demonstratively distinct plans of organization. What has been effected and recommended, in regard to homologous parts in the Vertebrata, should be followed out in the Articulata and Mollusca. In regard to the constituents of the crust or outer skeleton and its appendages in the Articulata, homological relations have been studied and determined to a praiseworthy extent, throughout that province. The same study is making progress in the Mollusca; but the grounds for determining special homologies are less sure in this sub-kingdom. The present state of homology in regard to the Articulata has sufficed to demonstrate that the segment of the crust is not a hollow expanded homologue of the segment of the endo-skeleton of a vertebrate. There is as little homology between the parts and appendages of the segments of the Vertebrate and Articulate skeletons respectively. The parts called mandibles, maxillæ, arms, legs, wings, fins, in Insects and Crustaceans, are only "analogous"

to the parts so called in Vertebrates. A most extensive field of reform is becoming open to the homogist in that which is essential to the exactitude of his science —a nomenclature equivalent to express his conviction of the different relations of similitude. Most difficult and recondite are the questions in face of which the march of Homology is now irresistibly conducting the philosophic observer. Such for instance, as the following:—Are the nervous, muscular, digestive, circulating and generative systems of organs more tham functionally similar in any two primary provinces of the animal kingdom? Are the homologies of entire systems to be judged of by their functional and structural connexions, rather than by the plan and course of their formation in the embryo? It may be doubted if embryology alone is decisive of the question whether homology can be predicated of the alimentary canal in animals of different primary groups or provinces. It is significant, however, of the lower value of embryological characters, to note that the great leading divisions of the animal kingdom, based by Cuvier on Comparative Anatomy, have merely been confirmed by Von Baer's later developmental researches. And so, likewise, with regard to some of the minor modifications of Cuvier's provinces, the true position of the Cirripeda was discerned by Straus Durkheim and Macleay, by the light of anatomy, before the discovery of their metamorphoses by Thomson. If, however, embryology has been over-valued as a test of homology, the study of the development of animals has brought to light most singular and interesting facts, and I now allude more especially to those that have been summed up under the term "Alternate-generation," "Parthenogenesis," "Metagenesis," &c. John Hunter first enunciated the general proposition, that "the propagation of plants depended on two principles, the one that every part of a vegetable is 'a whole,' so that it is capable of being multiplied as far as it can be divided into distinct parts; the other, that certain of those parts become reproductive organs, and produce fertile seeds." Hunter also remarked, that "the first principle operated in many animals which propagate their species by buds or cuttings;" but that, whilst in animals, it prevailed only in "the more imperfect orders," it operated in vegetables "of every degree of perfection." The experiments of Trembley on the freshwater polype, those of Spalanzani on the Naids, and those of Bonnet on the Aphides had brought to light the pheuomena of propagation by fission, and by gemmation or buds, external and internal, in animals to which Hunter refers. Subsequent research has shown the unexpected extent to which Hunter's first principle of propagation in organic being prevails in the animal division. But the earliest formal supercession of Harvey's axiom, "*omne vivum ab ovo*," appears to be Hunter's proposition of the dual principle above quoted. The experiments of Redi, Malpighi and others had progressively contracted the field to which the "*generatiò æquivoca*" could with any plausibility by applied. The stronghold of the remaining advocates of that old Egyptian doctrine was the fact of the development of parasitic animals in the flesh, brain and glands of higher animals. But the hypothesis never obtained currency in this country; it was publicly opposed in my 'Hunterian Lectures,' by the fact of the prodigious preparation of fertile eggs in many of the supposed spontaneously developed species; and in suggesting that the *Trichina spiralis* of the human muscular tissue might

be the embryo of a larger worm in course of migration, I urged that a particular investigation was needed for each particular species.

Among the most brilliant of recent acquisitions to this part of Physiology, have been the discoveries which have resulted from such special investigations. Kuchenmeister and Von Siebold have been the chief labourers in this field. After noticing some of the results of those labours, he said—Since the time when it was first discovered that plants and animals could propagate in two ways, and that the individual developed from the bud might produce a seed or egg, from which also an individual might spring capable of again budding,—since this alternating mode of generation was observed, as by Chamisso and Sars, in cases where the budding individual differed much in form from the egg-laying one—the subject has been systematised, generalized, with an attempt to explain its principle, and greatly advanced, especially, and in a highly interesting manner, in Von Siebold's late treatise, entitled 'Wahre Parthenogenesis bei Schmiterlingen und Bienen,' in which the virgin production of the male or drone bee is demonstrated. Von Siebold having subjected to the closest microscopic scrutiny and experiment the conclusion to which the practical Bee-master Dzierson had arrived relative to the cause of queen-bees with crippled wings producing a swarm exclusively of drones has demonstrated that the male bee is produced from an egg which has been subjected to no influence save that of the maternal parent; whilst such egg, if impregnated, would have produced a female or worker bee. The now well investigated phenomena of parthenogenesis in Hydrozoa have resulted in showing, as in the analogous case of Entozoa, that animals differing so much in form as to have constituted two distinct orders or classes, are really but two terms of a cycle of metagenetic transformations—the acalephan Medusa being the sexual locomotive form of the agamic rooted budding polype, just as the cestoid tænia is of the cysted hydatid. In Hydrozoa (hydroid polypes or sertularians) the young are propagated, as in plants, by "buds," and also, as in most plants, by "germs" or "seeds": these latter are contained in "germ-sacs" projecting from the outer surface, which is another analogy to the flowering parts of plants. The first acquaintance with these marvels excited the hope that we were about to penetrate the mystery of the origin of different species of animals; but as far as observation has yet extended, the cycle of changes is definitely closed. And, since one essential step in the series is the fertilized seed or egg, the Harveian axiom, "*omne vivum ab ovo*," if metagenetic phases be ascribed to one individual, may be still predicated of all organisms which bear the unmistakeable characters of plants or of animals. The closest observations of the subjects of these two kingdoms most favourable to clear insight into the nature of their beginning, accumulate evidence in proof of the essential first step being due to the protoplasmic matter of a germ-cell and sperm-cell; the former pre-existing in the form of a nucleus or protoplast, the latter as a granulose fluid. In flowering plants it is conveyed by the pollen-tube, in animals and many flowerless plants, by locomotive spermatozoids, The changes of form which the representative of a species undergoes in successive agamically propagating individuals are termed the "metagenesis" of such species. The changes of form which the representative of a species undergoes in a single individual, is called the "metamorphosis." But

this term has practically been restricted to the instances in which the individual, during certain phases of the change, is free and active, as in the grub of the chaffer, or the tadpole of the frog, for example. In reference to some supposed essential differences in the metamorphoses of insects, it had been suggested that stages answering to those represented by the apodal and acephalous maggot of the Diptera, by the hexapod larva of the Caribi, and by the hexapod antenniferous larva of the Meloe were really passed through by the orthopterous insect, before it quitted the egg. Mr. Andrew Murray has recently made known some facts in confirmation of this view. He had received a wooden idol from Africa, behind the ears of which a Blatta had fixed its egg-cases, after which the whole figure had been rudely painted by the natives, and these egg-cases were covered by the paint. No insect could have emerged without breaking through the case and the paint; but both were uninjured. In the egg-cases were discovered,—1st, a grub-like larva in the egg; 2nd, a cocoon in the egg containing the unwinged, imperfectly-developed insect; 3rd, the unwinged, imperfectly-developed insect in the egg, free from the cocoon, and ready to emerge.

The microscope is an indispensible instrument in embryological and histological researches, as also in reference to that vast swarm of animalcules which are too minute for ordinary vision. I can here do little more than allude to the systematic direction now given to the application of the microscope to particular tissues and particular classes, chiefly due, in this country, to the counsels and example of the Microscopical Society of London. A very interesting application of the microscope has been made to the particles of matter suspended in the atmosphere; and a systematic continuation of such observations by means of glass slides prepared to catch and retain atmospheric atoms, promises to be productive of important results. We now know that the so-called red snow of Arctic and Alpine regions is a microscopic single-celled organism which vegetates on the surface of snow. Cloudy or misty extents of dust-like matter pervading the atmosphere, such as have attracted the attention of travellers in the vast coniferous forests of North America, and have been borne out to sea, have been found to consist of the "pollen" or fertilizing particles of plants, and have been called "pollen showers." M. Daneste, submitting to microscopic examination similar dust which fell from a cloud at Shanghai, found that it consisted of spores of a confervoid plant, probably the *Trichodesmium erythræum*, which vegetates in, and imparts its peculiar colour to, the Chinese Sea. Decks of ships, near the Cape de Verde Islands, have been covered by such so-called "showers" of impalpable dust, which, by the microscope of Ehrenberg, has been shown to consist of minute organisms, chiefly "Diatomaceæ." One sample collected on a ship's deck, 500 miles off the coast of Africa exhibited numerous species of freshwater and marine diatoms bearing a close resemblance to South American forms of these organisms. Ehrenberg has recorded numerous other instances in his paper printed in the 'Berlin Transactions'; but here, as in other exemplary series of observations of the indefatigable microscopist, the conclusions are perhaps not so satisfactory as the well-observed data. He speculates upon the self-developing power of organisms in the atmosphere, affirms that dust-showers are not to be traced to mineral material from the earth's surface, nor to revolving masses of dust material

in space, nor to atmospheric currents simply; but to some general law connected with the atmosphere of our planet, according to which there is a "self-development" within it of living organisms, which organisms he suspects may have some relation to the periodical meteorolites or aërolites. The advocates of progressive development may see and hail in this the first step in the series of ascending transmutations. The unbiassed observer will be stimulated by the startling hypothesis of the celebrated Berlin Professor to more frequent and regular examinations of atmospheric organisms. Some late examinations of dust showers clearly show them to have a source which Ehrenberg has denied. Some of my hearers may remember the graphic description by Her Majesty's Envoy to Persia, the Hon. C. A. Murray, of the cloud of impalpable red dust which darkened the air of Bagdad, and filled the city with a panic. The specimen he collected was examined by my successor, at the Royal College of Surgeons, Prof. Quekett, and that experienced microscopist could detect only inorganic particles, such as fine quartz sand, without any trace of Diatomaceæ or other organic matter. Dr. Lawson has obtained a similar result from the examination of the material of a shower of moist dust or mud which fell at Corfu, in March, 1857; it consisted for the most part of minute angular particles of a quartzose sand. Here, therefore, is a field of observation for the microscopist, which has doubtless most interesting results as the reward of persevering research.

To specify or analyze the labours of the individuals who of late years have contributed to advance Zoology by the comprehensive combination of the various kinds of researches now felt to be essential to its right progress, would demand a proportion of the present discourse far beyond its proper and allotted limits. Yet I shall not be deemed invidious if I cite one work as eminently exemplary of the spirit and scope of the investigations needed for the elucidation of any branch of natural history. That work is the monograph of the Chelonian Reptiles (tortoises, terrapenes and turtles) of the United States of America, published last year at Boston, U.S., by Prof. Agassiz.

Observations of the characters of plants have led to the recognition of the natural groups or families of the vegetable kingdom, and to a clear scientific comprehension of that great kingdom of nature. This phase of botanical science gives the power of further and more profitable generalizations, such as those teaching the relations between the particular plants and particular localities. The sum of these relations, forming the geographical distribution of plants, rests, perhaps at present necessarily, on an assumption, viz., that each species has been created, or come into being, but once in time and space; and that its present diffusion is the result of its own law of reproduction, under the diffusive or restrictive influence of external circumstances. These circumstances are chiefly temperature and moisture, dependent on the distance from the source of heat and the obliquity of the sun's rays, modified by altitude above the sea level, or the degree of rarefaction of the atmosphere and of the power of the surface to wastefully radiate heat. Both latitude and altitude are further modified by currents of air and ocean, which influence the distribution of the heat they have absorbed. Thus large tracts of dry land produce dry and extreme climates, while large expanses of sea produce humid and equable climates. Agriculture affects the geographical

distribution of plants, both directly and indirectly. It diffuses plants over a wider area of equal climate, augments their productiveness, and enlarges the limits of their capacity to support different climatal conditions. Agriculture also effects local modifications of climate. Certain species of plants require more special physical conditions for health; others more general conditions; and their extent of diffusion varies accordingly. Thus the plants of temperate climates are more widely diffused over the surface of the globe, because they are suited to elevated tracts in tropical latitudes. There is, however, another law which relates to the original appearance, or creation of plants, and which has produced different species flourishing under similar physical conditions, in different regions of the globe. Thus the plants of the mountains of South America are of distinct species, and for the most part of distinct genera, from those of Asia. The plants of the temperate latitudes of North America are of distinct species, and some of distinct genera, from those of Europe. The Cacteæ of the hot regions of Mexico are represented by the Euphorbiaceæ in parts of Africa having a similar climate. The surface of the earth has been divided into twenty-five regions, of which I may cite as examples that of New Zealand, in which Ferns predominate, together with generic forms, half of which are European, and the rest approximating to Australian, South African, and Antarctic forms; and that of Australia, characterized by its Eucalypti and Epacrides, chiefly known to us by the researches of the great botanist, Robert Brown, the founder of the Geography of Plants.

Organic Life, in its animal form, is much more developed, and more variously in the sea, than in its vegetable form. Observations of marine animals and their localities have led to attempts at generalizing the results; and the modes of enunciating these generalizations or laws of geographical distribution are very analogous to those which have been applied to the vegetable kingdom, which is as diversely developed on land as in the animal kingdom in the sea. The most interesting form of expression of the distribution of marine life is that which parallels the perpendicular distribution of plants. Edward Forbes has expressed this by defining five bathymetrical zones, or belts of depth, which he calls,—1, Littoral; 2, Circumlittoral; 3, Median; 4, Infra-median; 5, Abyssal. The life-forms of these zones vary, of course, according to the nature of the sea-bottom; and are modified by those primitive or creative laws that have caused representative species in distant localities under like physical conditions,—species related by analogy. Very much remains to be observed and studied by naturalists in different parts of the globe, under the guidance of the generalizations thus sketched out, to the completion of a perfect theory. But in the progress to this, the results cannot fail to be practically most valuable. A shell or a sea weed, whose relations to depth are thus understood, may afford important information or warning to the navigator. To the geologist the distribution of marine life according to the zones of depth, has given the clue to the determination of the depth of the seas in which certain formations have been deposited. Had all the terrestrial animals that now exist diverged from one common centre within the limited period of a few thousand years, it might have been expected that the remoteness of their actual localities from such ideal centre would bear a certain ratio with their respective powers of locomotion. With regard to the class of Birds, one might have expected to

find that those which were deprived of the power of flight, and were adapted to subsist on the vegetation of a warm or temperate latitude, would still be met with more or less associated together, and least distant from the original centre of dispersion, situated in such a latitude. This, however, is not only not the case with birds, but is not so with any other classes of animals. The Quadrumana, or order of apes, monkeys and lemur, consist of three chief divisions—Caterhines, Platyrhines, and Strepsirhines. The first family is peculiar to the "Old World"; the second to South America; the third has the majority of its species and its chief genus (Lemur), exclusively in Madagascar. Out of twenty-six known species of Lemuridæ, only six are Asiatic, and three are African. Whilst adverting to the geographical distribution of Quadrumana, I would contrast the peculiarly limited range of the orangs and chimpanzees with the cosmopolitan powers of mankind. The two species of orang (Pithecus) are confined to Borneo and Sumatra; the two species of chimpanzee (Troglodytes) are limited to an intertropical tract of the western part of Africa. They appear to be inexorably bound by climatal influences regulating the assemblage of certain trees and the production of certain fruits. Climate rigidly limits the range of the Quadrumana latitudinally; creational and geographical causes limit their range in longitude. Distinct genera represent each other in the same latitudes of the New and Old Worlds; and also, in a great degree, in Africa and Asia. But the development of an orang out of a chimpanzee, or reciprocally, is physiologically inconceivable. The order of Ruminantia is principally represented by Old World species, of which 162 have been defined; whilst only 24 species have been discovered in the New World, and none in Australia, New Guinea, New Zealand, or the Polynesian Isles. The cameleopard is now peculiar to Africa; the musk deer to Africa and Asia; out of about fifty defined species of antelope, only one is known in America, and none in the central and southern divisions of the New World. Palæontology has expanded our knowledge of the range of the giraffe during Miocene or old Pliocene periods species of Cameleopardalis roamed in Asia and Europe. Geology gives a wider range to the horse and elephant kinds than was cognizant to the student of living species only. The existing Equidæ and Elephantidæ properly belong, or are limited to, the Old World; and the elephants to Asia and Africa, the species of the two continents, being quite distinct. The horse, as Buffon remarked, carried terror to the eye of the indigenous Americans, viewing the animal for the first time, as it proudly bore their Spanish conqueror. But a species of Equus, coexisted with the Megatherium and Megalonyx, in both South and North America, and perished apparently with them, before the human period. Elephants are dependant chiefly upon trees for food. One species now finds conditions of existence in the rich forests of tropical Asia; and a second species in those of tropical Africa. Why, we may ask, should not a third be living at the expense of the still more luxuriant vegetation watered by the Oronooka, the Essequibo, the Amazon, and the La Plata, in tropical America? Geology tells us that at least two kinds of elephant (*Mastodon Andium* and *M. Humboldtii*) formerly did derive their subsistence, along with the great Megatheroid beasts, from that abundant source. We may infer that the general growth of large forests, and the absence of deadly enemies, were the main conditions of the former existence of elephantine animals

over every part of the globe. We have the most pregnant proof of the importance of Palæontology in rectifying and expanding ideas deduced from recent zoology of the geographical limits of particular forms of animals, by the results of its application to the proboscidian or elephantine family. But such retrospective views of life in remote periods, in many important instances, confirm the zoologists deductions of the originally restricted range of particular forms of mammalian life. The sum of all the evidence from the fossil world in Australia proves its mammalian population to have been essentially the same in pleistocene, if not pliocene times, as now; only represented, as the Edentate mammals in South America were then represented by more numerous genera, and much more gigantic species, than now exist. But Geology has revealed more important and unexpected facts relative to the marsupial type of quadrupeds. In the miocene and eocene tertiary deposits, marsupial fossils of the American genus Didelphys have been found, both in France and England; and they are associated with Tapirs like that of America. In a more ancient geological period remains of marsupials, some insectivorous, as Spalacotherium and Triconodon, others with teeth like the peculiar premolars in the Australian genus Hypsiprymnus, have been found in the upper oolite of the Isle of Purbeck. In the lower oolite at Stonesfield, Oxfordshire, marsupial remains have been found having their nearest living representatives in the Australian genera Myrmecobius and Dasyurus. Thus it would seem, that the deeper we penetrate the earth, or, in other words, the further we recede in time, the more completely are we absolved from the present laws of geographical distribution. In comparing the mammalian fossils found in British pleistocene and pliocene beds, we have often to travel to Asia or Africa for their homologues. In the miocene and eocene strata some fossils occur which compel us to go to America for the nearest representatives. To match the mammalian remains from the English oolitic formations, we must bring species from the Antipodes. These are truly most suggestive facts. If the present laws of geographical distribution depend, in an important degree, upon the present configuration and position of continents and islands, what a total change in the geographical character of the earth's surface must have taken place since the "Stonesfield slate" was deposited in what now forms the County of Oxfordshire! These and the like considerations from the modifications of geographical distribution of particular forms or groups of animals, warn us how inadequate must be the phenomena connected with the present distribution of land and sea to guide to the determination of the primary ontological divisions of the earth's surface. Some of the latest contributions to this most interesting branch of natural history have been the result of endeavours to determine whether, and how many, distinct creations of plants and animals have taken place. But I would submit that the discovery of two portions of the globe, of which the respective Faunæ and Floræ are different, by no means affords the requisite basis for concluding as to distinct acts of creation. Such conclusion is associated, perhaps unconsciously, with the idea of the historical date of creative acts: it presupposes that the portion of the globe so investigated by the botanist and zoologist has been a separate and primative creation,—that its geographical limits and features are still in the main what they were when the creative fiat went forth. But geology has demonstrated that

such is by no means the case with respect to the portions of dry land now termed continents and islands. The incalculable vistas of time past, into which the same science has thrown light, are also shown to have periods during which the relative positions of land and sea have been ever changing.

Already the directions, and to a certain extent the forms of the submerged tracts that once joined what now are islands to continents, and which once united now separate or nearly disjoined continents by broad tracts of continuity, begin to be laid down in geological maps, addressing to the eye such successive and gradually progressive alterations of the earth's surface. These phenomena shake our confidence in the conclusion, that the Apteryx of New Zealand and the Red-grouse of England were distinct creations in and for those islands respectively. Always, also, it may be well to bear in mind that by the word "creation" the zoologist means "a process he knows not what." Science has not yet ascertained the secondary causes that operated when "the earth brought forth grass, and herb yielding seed after his kind," and when "the waters brought forth abundantly the moving creature that hath life." And supposing both the fact and the whole process of the so-called "spontaneous generation" of a fruit-bearing tree, or of a fish, were scientifically demonstrated, we should still retain as strongly the idea, which is the chief of the "mode" or "group of ideas" we call "creation," viz.: that the process was ordained by and had originated from an all wise and powerful First Cause of all things. When, therefore, the present peculiar relation of the Red-grouse (*Tetrao scoticus*) to Britain and Ireland—and I cite it as one of a large class of instances in Geographical Zoology—is enumerated by the zoologist as evidence of a distinct creation of the bird in and for such islands, he chiefly expresses that he knows not how the Red-grouse came to be there and there exclusively; signifying also by this mode of expressing such ignorance, his belief that both the bird and the islands owed their origin to a great first Creative Cause. And this analysis of the real meaning of the phrase "distinct creation," has led me to suggest whether, in aiming to define the primary zoological provinces of the globe, we may not be trenching upon a province of knowledge beyond our present capacities; at least in the judgment of Lord Bacon, commenting upon man's efforts to pierce into the "dead beginnings of things."

On the few occasions in which I have been led to offer observations on the probable cause of the extinction of species, the chief weight has been given to those gradual changes in the conditions of a country affecting the due supply of sustenance to animals in a state of nature. I have also pointed out the characters in the animals themselves calculated to render them most obnoxious to such extirpating influences; and on one occasion I have applied the remarks to the explanation of so many of the larger species of particular groups of animals having become extinct, whilst smaller species of equal antiquity have remained. In proportion to its bulk is the difficulty of the contest which, as a living organized whole, the individual of such species has to maintain against the surrounding agencies that are ever tending to dissolve the vital bond and subjugate the living matter to the ordinary chemical and physical forces. Any changes, therefore, in such external agencies as a species may have been originally adapted to exist in, will militate against that existence in a degree proportionate, perhaps in a geo-

metrical ratio, to the bulk of the species. If a dry season be gradually prolonged, the large mammal will suffer from the drought sooner than the small one: if such alteration of climate affect the quantity of vegetable food, the bulky herbivore will first feel the effects of stinted nourishment; if new enemies are introduced, the large and conspicuous quadruped or bird will fall a prey, while the smaller species conceal themselves and escape. Smaller animals are usually also more prolific than larger ones. "The actual presence, therefore, of small species of animals in countries where larger species of the same natural families formerly existed, is not the consequence of any gradual diminution of the size of such species, but is the result of circumstances which may be illustrated by the fable of the 'Oak and the Reed;' the smaller and feebler animals have bent and accommodated themselves to changes which have destroyed the larger species." No doubt the type-form of any species is that which is best adapted to the conditions under which such species at the time exists; and as long as those conditions remain unchanged, so long will the type remain; all varieties departing therefrom being in the same ratio less adapted to the environing conditions of existence. But, if those conditions change, then the variety of the species at an antecedent date and state of things will become the type-form of the species at a later date, and in an altered state of things. Observation of animals in a state of nature is required to show their degree of plasticity, or the extent to which varieties do arise: whereby grounds may be had for judging of the probability of the elastic ligaments and joint-structures of a feline foot, for example, being superinduced upon the more simple structure of the toe with the non retractile claw, according to the principle of a succession of varieties in time. Observation of fossil remains is also still needed to make known the ante-types, in which varieties, analogous to the observed ones in existing species, might have occurred, so as to give rise ultimately to such extreme forms as the Giraffe, for example. The aboriginal laws of the geographical distribution of plants and animals have been modified from of old by geological and the concomitant climatal changes; but they have been much more disturbed by man since his introduction upon the globe. The serviceable plants and animals which he has carried with him in his migrations have flourished and multiplied in lands the most remote from the habitats of the aboriginal species. Man has, also, been the most potent and intelligible cause of extirpation of species within historic times. He alone, with one of the beasts which he has domesticated—the dog—is cosmopolitan. The human species is represented by a few well-marked varieties; and there is a certain amount of correspondence between their localities and general zoological provinces. But, with regard to the alleged conformity between the geographical distribution of man and animals, which has of late been systematically enunciated, and made by Agassiz, in Gliddon & Nott's 'Varieties of Mankind,' the basis of deductions as to the origin and distinction of the human varieties: many facts might be cited, affecting the conformity of the distribution of man with that of the lower animals and plants, as absolutely enunciated in some recent works. Nor can we be surprised to find that the migratory instincts of the human species, with the peculiar endowment of adaptiveness to all climates, should have produced modifications in geographical distribution to which the lower forms of living nature have not been

subject. Ethnology is a wide and fertile subject, and I should be led far beyond the limits of an inaugural discourse were I to indulge in an historical sketch of its progress. But I may advert to the testimony of different witnesses—to the concurrence of distinct species of evidence—as to the much higher antiquity of the human race, than has been assigned to it in historical and genealogical records.

Mr. Leonard Horner discerned the value of the phenomena of the annual sedimentary deposits of the Nile in Egypt as a test of the lapse of time during which that most recent and still operating geological dynamic had been in progress. In two Memoirs communicated to the Royal Society in 1855 and 1858, the result of ninety-five vertical borings through the alluvium thus formed are recorded. In the excavations near the colossus of Rameses II. at Memphis, there were 9 feet 4 inches of Nile sediment between 8 inches below the present surface of the ground and the lowest part of the platform on which the statue had stood Supposing the platform to have been laid in the middle of the reign of that king, viz. 1361 B.C., such date added to A.D. 1854 gives 3,215 years during which the above sediment was accumulated; or a mean rate of increase of 3½ inches in a century. Below the platform there were 32 feet of the total depth penetrated; but the lowest 2 feet consisted of sand, below which it is possible there may be no true Nile sediment in this locality, thus leaving 30 feet of the latter. If that amount has been deposited at the same rate of 3½ inches in a century, it gives for the lowest part deposited an age of 10,285 years before the middle of the reign of Rameses II., and 13,500 years before A.D. 1854. The Nile sediment at the lowest depth reached is very similar in composition to that of the present day. In the lowest part of the boring of the sediment at the colossal statue in Memphis, at a depth of 39 feet from the surface of the ground, the instrument is reported to have brought up a piece of pottery. This, therefore, Mr. Horner infers to be a record of the existence of man 13,371 years before A.D. 1854:—"Of man, moreover, in a state of civilization, so far at least, as to be able to fashion clay into vessels, and to know how to harden then by the action of a strong heat." Prof. Max Müller has opened out a similar vista into the remote past of the history of the human race by the perception and application of analogies in the formation of modern and ancient, of living and dead, languages. From the relations traceable between the six Romance dialects, Italian, Wallachian, Rhætian, Spanish, Portuguese, and French, an antecedent common "mother-tongue" might be inferred, and, consequently the existence of a race anterior to modern Italians, Spanish, French, &c., with conclusions as to the lapse of time requisite for such divisions and migrations of the primitive stock, and for the modifications which the mother-language had undergone. History and preserved writings show that such common mother-race and language have existed in the Roman people and the Latin tongue. But Latin like the equally "dead" language Greek, with Sanscrit, Lithuanian, Zend, and the Gothic, Sclavonic, and Celtic tongues, can be similarly shown to be modifications of one antecedent common language; whence is to be inferred an antecedent race of men, and a lapse of time sufficient for their migration over a tract extending from Iceland in the north-west to India in the south-east, and for all the above-named modifications to have been established in the common mother "Arian" tongue.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—OCTOBER, 1859.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Days	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Excess of mean above Average.	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N.
1	29.419	29.463	29.646	29.5267	49.4	58.7	43.6	48.45	−1.97	.312	.22.	.221	.256
2	.706	.680	.502	.5013	40.7	57.5	57.4	52.38	+2.45	.204	.291	.378	.300
3	.209	.134	—	—	56.0	70.3	—	—		.423	.530		
4	.345	.406	.511	.4370	57.0	59.2	40.7	52.40	+3.87	.341	.321	.172	.276
5	.065	.738	.843	.7022	44.8	63.5	49.4	52.23	+3.62	.235	.167	.244	.220
6	.868	.750	.818	.6900	41.8	56.6	54.1	51.65	−3.44	.29.	.211	.282	.253
7	.112	.071	.253	.1410	56.3	58.8	37.5	49.78	1.83	.422	.272	.162	.277
8	.201	.151	.178	.1727	35.7	45.1	40.5	41.52	−5.19	.142	.148	.163	.161
9	.302	.479	.712	.5104	40.0	48.7	39.8	43.68	3.38	.205	.225	.200	.211
10	.833	.836	—		42.5	52.7	—			.217	.215		
11	.894	.838	.800	.8470	42.2	47.6	45.8	45.40	−0.85	.240	.183	.163	.206
12	.739	.639	.567	.6310	45.4	50.1	51.0	49.25	+3.27	.220	.363	.343	.292
13	.475	.368	.427	.4258	53.8	55.0	47.6	51.07	6.46	.370	.349	.282	.322
14	.867	.479	.615	.5060	43.3	49.6	45.3	46.06	0.73	.221	.229	.235	.22.
15	.725	.810	.906	.8255	39.1	52.8	43.6	44.07	0.12	.204	.26.	.21.	.22.
16	30.014	.991	.936	.9634	44.8	48.5	50.1	48.42	+3.88	.250	.278	.292	.27.
17	29.963	.955	—	—	48.0	62.1				.30.	.32.		
18	.984	.889	.832	.8960	42.9	62.2	50.6	52.57	+9.56	.248	.331	.316	.302
19	.823	.814	.838	.8295	47.6	65.7	51.2	54.68	10.90	.30.	.413	.257	.328
20	.839	.792	.804	.8153	49.4	57.4	55.6	53.78	+10.26	.309	.317	.3..	.306
21	.790	.798	.782	.7883	50.5	51.2	50.7	51.13	+7.88	.307	.335	.317	.321
22	.730	.712	.618	.6787	49.1	54.7	50.1	51.03	8.97	.31.	.272	.30.	.29.
23	.671	.701	.801	.7310	43.1	54.5	47.0	48.70	+6.95	.224	.244	.243	.235
24	.946	.831	—		46.9	51.6	—	—		.26.	.293		—
25	.953	.940	.957	.9583	44.0	48.0	41.5	43.78	+1.56	.207	.168	.151	.157
26	.964	.952	.956	.9616	34.2	46.9	37.0	39.87	−2.12	.110	.158	.135	.134
27	.970	.934	.961	.9633	35.9	51.2	43.4	43.25	+1.46	.120	.156	.19.	.154
28	.965	.892	.836	.8800	40.2	51.4	51.4	48.13	+0.67	.175	.260	.224	.218
29	.735	.617	.571	.6430	48.0	51.0	51.9	50.65	+9.35	.300	.338	.362	.335
30	.463	.454	.557	.4985	52.3	56.5	40.8	52.47	+11.55	.357	.425	.29.	.358
31	.597	.640	—		45.8	53.6			—	.247	.29.	—	—
M	29.6945	29.6690	29.6860	29.6813	45.05	53.78	47.48	48.79	+3.76	.232	.262	.252	.256

Days	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't.	M'N.	Rain in Inches.	Snow in Inches.
1	.88	.52	.77	.73	N N E	N W b N	N N W	N 23 W	5.0	18.0	1.4	7.75	8.18	0.010	...
2	.80	.61	.80	.73	Calm.	S E b S	S E	S 24 E	0.0	6.2	9.2	5.03	6.85		...
3	.93	.58	—	—	S S E	S W b W	W b S	S 60 W	1.2	14.0	10.0	7.24	7.70	0.035	...
4	.73	.64	.53	.66	W N W	W b N	Calm	N 77 W	2.4	10.0	0.0	4.29	4.30	0.005	...
5	.79	.28	.60	.62	W N W	W	Calm.	N 55 W	6.8	14.5	0.0	6.75	7.04		.
6	.89	.45	.66	.66	N W b N	E	E b S	S 82 E	1.0	8.0	11.0	6.33	6.62	0.165	...
7	.93	.50	.71	.73	S E b E	W b S	W b S	S 81 W	3.3	27.8	11.0	13.74	14.67	0.246	...
8	.17	.46	.76	.61	S W b W	W b S	S W b W	S 69 W	9.2	15.3	9.4	11.75	11.93	0.032	Inap
9	.85	.64	.81	.74	Calm	N W b N	W b N	N 56 W	0.0	19.8	2.2	7.06	7.50	0.050	...
10	.83	.53	—	—	W b N	W b S	W	N 63 W	2.0	9.6	1.0	3.79	3.39		...
11	.89	.54	.62	.69	Calm	E b N	E b N	N 72 E	0.0	7.8	7.3	7.56	7.82	Inap	.
12	.72	.85	.92	.82	E N E	E N E	E	S 84 E	13.5	7.8	2.2	6.09	8.10	0.090	...
13	.90	.82	.86	.83	Calm	S S W	Calm	S 33 W	0.0	11.0	0.0	4.60	4.96	0.500	.
14	.78	.65	.78	.72	S W b S	S W	W	S 55 W	4.0	11.0	5.0	6.73	6.85		...
15	.86	.65	.74	.75	Calm	S W b S	N b W	S 82 W	0.0	1.4	1.2	0.42	1.14		...
16	.79	.81	.80	.81	N N E	E N E	E N E	N 67 E	1.4	1.7	4.2	4.47	4.53	0.030	...
17	.80	.58			Calm	Calm	Calm	S 10 W	0.0	0.0	0.0	2.11	2.12	...	...
18	.89	.59	.85	.77	Calm	S b W	Calm	S 19 W	0.0	8.8	0.0	3.47	3.51	..	...
19	.92	.65	.67	.76	Calm	N W b N	N b W	N 10 W	0.0	1.4	9.9	5.60	5.91		...
20	.8.	.67	.75	.74	N	E	E N E	N 71 E	7.8	10.0	7.0	7.06	7.35		...
21	.83	.80	.94	.86	E N E	E b N	E b S	N 77 E	12.6	1.5	2.0	3.65	3.60	0.300	...
22	.91	.63	.83	.8.	S E b E	S	Calm.	S 15 W	2.2	5.4	0.0	1.77	3.33	0.020	—
23	.86	.56	.74	.69	N W b W	N N W	N	N 28 W	1.0	4.8	6.2	3.57	5.69	..	...
24	.81	.77			N b E	E S E	E	N 49 E	1.8	5.8	7.5	4.54	5.62	.	...
25	.71	.32	.57	.55	N E	E	N E	N 61 E	4.3	12.3	8.2	6.34	7.04	--	...
26	.55	.40	.59	.54	N N E	E b N	N E	N 57 E	6.0	12.5	3.2	5.04	5.64		...
27	.56	.42	.69	.54	N	E b S	E	N 55 E	4.8	3.5	3.0	2.35	2.74		...
28	.61	.65	.60	.63	N E b N	E b N	E	N 83 E	4.2	14.5	15.2	11.57	11.78	0.020	...
29	.89	.90	.94	.90	E b N	Calm.	Calm.	S 87 E	9.5	0.0	0.0	2.09	2.11	0.145	...
30	.91	.94	.79	.88	Calm	S W b S	Calm.	S 46 W	0.0	9.0	0.0	3.31	4.05	0.025	...
31	.82	.63			S W b S	W b S	W	S 67 W	1.6	3.9	1.4	3.21	3.49	Inap	...
M	.80	.62	.75	.72	...	...	...	...	3.40	8.94	4.45	...	5.96	1.797	Inap

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR OCTOBER.

Highest Barometer........................ 30.042 at 8 a. m., on 16th } Monthly range=
Lowest Barometer .... 29.000 at 10 a. m., on 7th } 1.042 inches

Self-registering Thermom.
- Maximum Temperature............ 76°3 on 3rd at 2 p.m. } Monthly range=
- Minimum Temperature........ ... 31°5 on 26th at a.m. } 44°8
- Mean maximum Temperature .... 55°79 } Mean daily range=
- Mean minimum Temperature .... 43°41 } 12°37
- Greatest daily range .... 24°0 from a. m. to p. m. on 5th.
- Least daily range.................. 5°0 from a. m. to p. m. on 21st.

Warmest day......... 19th ... Mean temperature......... 54.08 } Difference = 14°81.
Coldest day......... 26th . . Mean temperature......... 39°87 }

Maximum { Solar.............................. 86°3 on p. m. of 3rd } Monthly range=
Radiation. { Terrestrial .... 25°1 on a. m. of 26th } 61°7.

Aurora observed on 10 nights, viz., on 1st, 2nd 4th 5th, 9th, 10th, 18th, 26th, 27th and 30th.

Possible to see Aurora on 15 nights; impossible on 16 nights.

Snowing on 1 day,—depth inapp inches; duration of fall 0 2 hours.

Raining on 17 days,—depth 1.797 inches; duration of fall 40.2 hours.

Mean of cloudiness = 0.60.

Most cloudy hour observed, 2 p. m., mean = 0.65; least cloudy hour observed 10 p. m., mean, = 0.56.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1198.83	969.88	1597.49	1749.80

Resultant direction N. 54° W.; Resultant Velocity 0.36 miles per hour.

Mean velocity..... ... . 5 96 miles per hour.
Maximum velocity .... 27.8 miles from 1.30 to 2.30 p. m. on 7th.
Most windy day .... 7th Mean velocity 14.07 miles per hour.
Least windy day .... 15th ..Mean velocity 1.14 ditto.
Most windy hour ... noon to 1 p. m. ....Mean velocity 9.39 ditto. } Difference
Least windy hour ....5 to 6 a. m. ....Mean velocity 3.81 ditto. } 5.58 miles.

Thunderstorm on 7th, from 6 to 8 a. m.
Distant Thunder on 19th, at 7 p. m. in N W.
Sheet Lightning on 2nd, at 7 p. m. in N W.
Haloes on 17th, imperfect Halo and Parhelia round the sun 4.15 p. m. On 17th perfect Halo round moon at 9 p. m. On 20th perfect Halo round moon at midnight.
Corona on 28th round the moon from 9 p. m.

First Snow on 8th, slight particles noted at 10.30 p. m.
First Ice on 8th, at 6 a. m. (¼ inch thick).
Indian Summer from 18th to 28th (not well marked).
Donatti's Comet visible to the naked eye from 13th September to 18th October.
4th Shower of Hail and Sleet at 4 p. m. 7th Rainbow observed at 7.30 a. m. 13th very violent Squall of wind, rain and lightning from 7.05 to 7 35 p. m.
The Resultant Direction and Velocity of the Wind for the month of October from 1848 to 1858 inclusive, were respectively N 54° W and 1.34 miles.
The Mean Temperature of October was 3°4 above the average of the last 19 years, it was the warmest month of the series with the exception of 1854.

COMPARATIVE TABLE FOR OCTOBER.

Year.	Temperature: M'n.	Diff. from Aver.	Max ob'd.	Min ob'd.	Range.	Rain: No. of days.	Inch's.	Snow: No. of days.	Inch's.	Wind: Resultant Direction.	V'y	Mean Force or Velocity.
1840	° 44.4	° −1 0	° 68.5	° 23.0	° 44.6	13	1.880	3	...	...	...	....
1841	41.6	−3.8	58.3	20 3	38 0	6	1.360	2	...	...	...	0.41 lbs.
1842	45.1	−0 3	68.5	30 0	38 5	8	5.175	0	...	...	...	0 35
1843	41.8	3 6	65.7	24 5	41 2	13	3 700	4	2.5	...	...	0.54
1844	43.3	−2 1	69.6	17 8	51.8	7	impft.	4	12 0	...	...	0.43
1845	46.4	+1 0	62.7	20 0	42.7	11	1 760	1	inapp.	...	...	0 26
1846	44.6	−0 8	60 7	20.7	40.0	14	4 180	2	inapp.	...	...	0.44
1847	44.0	1 4	65 0	20.3	44.7	13	4 898	2	inapp.	...	...	0.19
1848	46 3	+0 9	62 2	26 4	35.8	11	1 650	0	0 0	N 54° W	1.24	4 60 mls.
1849	45.3	−0 1	59.2	25 5	33.7	13	5 965	1	inapp.	N 12° W	1 27	4.70
1850	45.4	0 0	66 8	24.8	41.8	10	3 085	0	0 0	N 60° W	1 10	5 30
1851	47 4	+2 0	66 1	25 0	41 1	10	1 680	2	0.3	S 72° W	1.08	4 39
1852	48 0	+2.6	70 7	29.8	40 9	12	5 280	0	0.0	N 5° E	1 19	4 47
1853	44 4	−1.0	64 7	25.5	39 2	10	0.875	2	inapp.	S 69° W	1 74	4.77
1854	49 5	+4 1	74 2	29.8	44 4	15	1 495	3	inapp.	N 25° E	1 20	4.60
1855	45.4	0.0	64.3	28.0	36.3	14	2.485	5	0 8	N 82° W	4 91	9 88
1856	45.3	−0 1	70 1	23 3	46.8	10	0 875	2	0.1	N 76° W	2 15	6.07
1857	45.4	0.0	63.5	27.7	35.8	10	1 040	3	0.2	N 19° W	2.93	6 24
1858	48.8	+3 4	76.3	34.2	42.1	17	1 797	1	inapp.	N 34° W	0 36	5 96
M	45.39	...	66.63	25.15	41.49	11.4	3.047	1.9	0.99	....	...	5.55 Mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—NOVEMBER, 1868.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't. Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result'.	ME'N	Rain in inches.	Snow in inches.
1	29.838	29.936	29.970	29.9310	46 9	52 0	45 4	47 93	+ 7 47	276	312	201	260	.86	80	66	77	Calm.	E S E	E b N	N 69 E	0 0	7.0	14 6	9 07	10 06	inap.	...
2	.938	.842	794	8535	43 2	45.1	44 2	43.88	+ 3 62	248	185	209	219	92	61	72	77	N E b N	E b N	E b N	N 76 E	16.2	19 8	20 5	19 40	19 53	0 977	...
3	.769	.730	.719	7888	44 2	49 5	45 8	44 42	+ 4.42	259	264	287	268	90	90	93	92	E	E	E b N	N 89 E	20 3	12 5	18 8	9 39	9 52	0.568	...
4	.872	.613	.635	.6585	45 8	47 9	46 5	46 37	+ 6 60	287	282	268	277	93	87	84	87	E b N	E N E	Calm.	N 49 E	0 3	1.8	0 0	0 54	0 77	0.026	...
5	.623	.608	.569	6135	42 2	47.1	48 0	45 53	+ 6 05	252	269	280	266	94	83	86	87	N N W	N W b N	E	N 76 E	0 8	1 0	9.2	5 67	6 05	0.210	...
6	.464	.350	317	.3760	41 7	43 8	36 4	41 40	+ 2.25	243	237	192	223	82	82	89	85	E N E	N E b E	N N E	N 51 E	13 6	9.2	7.7	7 06	7 69	0.842	...
7	.304	.308	—	—	36 4	44 5		—	-	200	237	—	—	98	81	-	—	Calm.	Calm	N W b N	N 41 W	0.0	0 0	3 0	0.63	0 99	0 085	...
8	.369	.438	.534	4605	37 1	48 9	38 4	38.73	+ 0.01	200	239	175	195	90	86	81	89	Calm	N W	N	N 24 W	0.0	11 2	6.6	7 12	7 57	inap.	...
9	.568	.553	546	5540	33 5	35.7	33 0	34 02	4 38	138	136	160	144	78	65	80	74	N b W	N b W	N b E	N 6 E	6.4	8.8	4 4	5 40	5 57	.	0 1
10	.594	.609	.797	.7008	29 5	33 2	27.0	29 38	— 8.70	144	137	120	129	87	72	88	78	N b E	N b W	Calm.	N 1 E	4.9	4 8	0 0	4.59	4 76	..	inap.
11	.881	801	.749	.8028	21 6	31 5	27 0	26 65	11 13	087	134	093	097	76	75	63	67	N b E	S E b E	E b S	N 74 E	5.8	4 0	8.2	2 15	2 62	.	...
12	.709	622	.408	6030	25 0	33 2	36.2	34 53	— 2 97	118	125	205	147	81	54	69	78	N E b E	E S E	S S E	S 26 E	3.1	5 5	12 5	6.00	8 23	0.395	...
13	.319	.334	618	.4850	36 4	35.2	22 7	30 30	— 6 68	209	168	080	143	97	57	66	81	W b S	N W b N	W N W	N 61 W	6 2	21.0	8 5	9 64	10.88	0 070	0.2
14	.676	.662	—		20 5	28 5	—		—	093	132		-	85	85	—	—	Calm	N W b W	W b S	N 82 W	0 0	4 0	2 5	3 62	3.77	...	0.3
15	.695	.639	.664	.6803	23 4	25.4	20 5	23 47	—13 03	108	084	093	097	86	61	85	78	W b S	N W	W N W	N 54 W	3 0	12 8	2 5	9 04	9.31	..	0 1
16	.615	554	609	6032	23 4	31 2	30.3	28 70	— 7.50	115	108	150	124	92	61	69	79	W N W	W N W	W b N	N 75 W	0 0	23 0	13 7	12 53	12.86	..	0.1
17	703	.680	.661	.6833	26 7	38 2	33 9	33 10	— 2 70	133	105	128	120	92	46	65	65	W S W	W S W	S W b W	S 75 W	10 0	15 7	7 6	10 56	10 89	..	...
18	.602	596	.646	6185	29 2	36 8	35 3	33 86	— 1 03	132	151	139	139	81	69	67	71	W b S	W S W	W b N	S 88 W	3 1	15.9	15 6	13 51	13.82	..	inap.
19	.898	.755	.753	.7842	20 2	31 2	27 7	28.85	6 23	106	072	090	090	66	40	64	57	W	N W b W	W S W	N 80 W	17 3	18 8	11 5	11 70	13.01	...	inap.
20	715	.592	.526	6080	25 2	39 7	33.2	32 05	— 2 72	115	106	166	131	85	43	87	74	S W	N W	N W	N 42 W	8 5	4 9	4 0	3 39	6 64	.	...
21	.409	.428	—		31 6	38 0				146	169	—	—	74	70	-	—	N E b N	N E	N E	N 41 E	11 0	2.8	4 1	4 95	4 97		...
22	634	.550	448	6290	27 7	39 5	33.6	33.40	+ 1 32	121	160	172	167	80	66	73	76	N b W	E	E	N 78 E	10 5	14 5	14 3	12 49	13 66	0 680	...
23	.812	.312	367	3358	35 0	33 5	31 2	32 05	— 0 72	103	178	152	170	95	90	87	91	E N E	N E	N N E	N 43 E	15 3	11.2	6 4	7 87	8 33	0 125	1.5
24	.406	.490	.580	5042	31 0	29 5	30 6	30 17	— 3 10	147	129	134	136	85	78	78	81	N b W	N W b N	N W b N	N 32 W	1 0	19 6	21 5	14 77	14 94		0.2
25	.667	.688	.737	.7028	29 9	31 5	29.6	30.16	— 2 78	146	158	158	154	87	89	97	91	N W b N	W N W	W b N	N 52 W	14.2	18 0	8.8	12 09	12 33	.	...
26	820	.864	.901	.8488	30.6	31 0	30 0	30 73	— 1 83	138	126	138	139	80	72	80	81	N W	N W	W N W	N 56 W	8 0	22 3	17 5	13 04	13 66	...	...
27	.693	.788	.658	.7708	23 4	33 2	32.6	29 87	— 2 82	101	143	151	137	61	76	81	82	W b N	W b N	W b N	S 30 W	3 0	2 0	0 4	1 66	3 05	..	0.8
28	.496	.339	—	—	32 4	34.1	—	—	—	153	148		—	83	76	—	—	S E b E	N E b N	N N E	N 41 E	4 5	6 5	9 0	6 33	6 90	...	...
29	.420	.398	.248	.3533	24 8	29 0	35 3	30 25	— 1.25	120	135	146	136	90	81	71	81	N b E	W N W	S S W	S 55 W	7 5	4 8	21 3	7 33	11 03	.	0 2
30	.340	.606	871	6452	30.3	27 0	22 7	25 97	— 6 12	156	121	095	121	92	82	78	84	W b S	N W b W	W b S	N 71 W	23.4	21.9	8 1	11 33	12 72		0 6
M	29 .6823	29 .6163	29.6311	29.6267	32.30	36.58	33.95	34.18	— 1.09	.165	168	.161	162	86	72	.79	.70	...	...	...	...	7.43	10 80	9.19		8 87	3.679	4.0

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR NOVEMBER, 1858.

Highest Barometer . . . . 29.970 at 10 p.m. on 1st, } Monthly range=
Lowest Barometer . . . . 29.190 at midnight on 29th } 0.780 inches.

Self-registering Ther. { Maximum temperature . . . . 53°0 on p. m. of 1st } Monthly range=
Minimum temperature . . . . 15°3 on a. m. of 15th } 37°7
Mean maximum temperature . . 37°90 } Mean daily range = 7°87
Mean minimum temperature . . 30°03 }
Greatest daily range . . . . . . 17°3 from a. m. to p. m. on 20th.
Least daily range . . . . 3 2 from a. m. to p. m. on 23rd.

Warmest day . . 1st . Mean Temperature . . . 47°93 } Difference=24°46.
Coldest day . . . . 15th ... Mean Temperature . . . 23°47 }

Maximum { Solar . . . . 61°8 on p. m of 1st } Monthly range=
Radiation { Terrestrial . . . . . . 4.9 on a. m. of 15th } 56°9

Aurora observed on 3 nights, viz.: on 7th, 10th, and 15th; possible to see Aurora on 10 nights; impossible on 20 nights.

Snowing on 13 days; depth, 4.0 inches; duration of fall 48.0 hours.

Raining on 12 days; depth, 3·879 inches; duration of fall, 84.9 hours.

Mean of cloudiness=0.81; most cloudy hour observed, 2 p. m., mean=0.91: least cloudy hour observed, 6 a. m., mean=0.71.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
2571.97	630.91	2007.97	2960.96

Resultant direction, N 25° W; Resultant Velocity, 3.14 miles per hour.
Mean velocity of the wind 8.87 miles per hour.
Maximum velocity . . . 28.2 miles per hour, from 5 to 6 p.m. on 13th.
Most windy day . . . . . . 2nd—Mean velocity, 19.53 miles per hour.
Least windy day . . . . 4th—Mean velocity, 0.77 do
Most windy hour, 1 to 2 p. m.—Mean velocity, 10.93 do } Difference
Least windy hour, 7 to 8 a. m.—Mean velocity, 5.90 do } 5.03 miles.

Dense Fog from 2 p. m. of 3rd, continuing with but little intermission till 2 p. m. of 5th.
9th. First measurable snow of the season.
9th. Thin ice on the pools at 6 a. m.
15th. Corona round the moon from 7.30 p. m.
17th. Halo round the moon from 5 to 7 p. m.
23rd. Corona round the moon from 9 p. m.
27th. Halo round the moon at 6 a. m.
30th. Corona round Jupiter 8 to 9 p. m.

The Resultant Direction and Velocity of the Wind for the month of November, from 1848 to 1858 inclusive, were respectively N 75° W, and 2 04 miles.

The month of November, 1858, was cold, windy, wet and cloudy. The mean temperature having been 2°33 below the average; whilst the velocity of the wind was 1 88 miles; the depth of rain 0.886 inches, the depth of snow 0.08 inches, and the clouded sky 08 in excess of their respective averages.

COMPARATIVE TABLE FOR NOVEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average	Maximum observed.	Minimum observed.	Range.	No. of days	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Velocity
1840	35.9°	— 0.6°	54.4°	20.5°	33.9°	6	1 220	6	...	...	...	...
1841	35.0	1.5	63 2	7.6	55 6	8	2 450	5	...	...	...	0.91lbs
1842	33.3	— 3 2	50 6	7 6	43 0	9	5 310	10	...	...	...	1 29 "
1843	33.5	3 0	51 2	14 4	36.8	10	4 765	7	1 2	...	..	0 69 "
1844	34.9	— 1 6	49.8	12 0	37 8	6	Imp't	4	8 0	..	..	0 48 "
1845	36.8	+ 0 3	58 8	7.6	51 2	7	1.103	4	5 0	...	...	0.53 "
1846	41.3	+ 4 8	55 5	18 2	37 3	12	5 805	2	0.4	...	...	0 64 "
1847	38 6	+ 2 1	58 2	7.8	50.4	14	3 185	3	inap.	...	.	0.36 "
1848	34.5	— 2 0	49 3	16 5	32.8	9	2 020	3	1.4	N 61 W	1.81	4.81ms.
1849	42 6	+ 0 1	56 7	28 4	28.3	10	2 815	2	1.0	N 39 W	1 55	4 78 "
1850	35.8	+ 2 3	62 3	18 1	44.2	7	2.955	1	inap.	N 42 W	1 43	5 27 "
1851	32 9	— 3 6	50 1	16 5	33.6	5	3 885	6	6 7	N 50 W	1 25	4 70 "
1852	36 0	— 0 5	50.4	18.7	31 7	7	1 775	3	2.0	N 59 W	1.53	6 50 "
1853	38 7	+ 2 2	54 1	14.4	39.7	15	2 423	6	2 7	N 9 W	0 55	5 52 "
1854	36 8	+ 0 3	54.9	15 1	39.8	13	1 115	4	1 3	S 88 W	3 72	7 58 "
1855	38 6	+ 2 1	54 1	18 7	35.4	8	4 500	6	3.0	N 66 W	3 18	10.81 "
1856	37.4	+ 0 9	56.4	22 8	33 6	10	1 375	9	9 5	S 85 W	2 95	8 75 "
1857	33.5	— 3 0	57 6	—2.8	60.1	14	3 235	9	6.9	S 61 W	5 45	9 25 "
1858	34.2	— 2.3	52.0	20.5	31.5	12	3 879	13	4 0	N 25 W	3 14	8 87 "
Mean	36 49	...	54.75	14 90	39 85	9.6	2 993	5.5	3.92	...	...	6 99

THE CANADIAN JOURNAL.

NEW SERIES.

No. XX.—MARCH, 1859.

THE PRESIDENT'S ADDRESS.

AY THE HON. G. W. ALLAN, M.L.C.

Read before the Canadian Institute, January 8th, 1859.

GENTLEMEN OF THE CANADIAN INSTITUTE,—After an absence of more than two years from Canada, I find myself again placed, by your kindness, in the office which I had the honor of filling when last among you. In resuming the Chair as your President, permit me to express the very great gratification which I feel at being thus assured, by your choice, of your continued confidence in the earnestness and sincerity of my desires for the advancement and prosperity of the Institute.

I rejoice to have it in my power to congratulate my brother Members on the continued success which has marked the Society's career, and the increasing support which it attracts year by year, as evinced by the large accession of new Members, and the many valuable additions to the Library and Museum.

I had indeed hoped, that on my return to Canada I should have found the Institute installed in a permanent home of its own, in a building worthy of the high objects of the Society, with suitable accommodation for its library and increasing collections in natural history, geology, and other departments of science.

But the commercial difficulties of the past two years, and the general depression in the monetary affairs of the Province, sufficiently account for these pleasant anticipations not having been realized; and the Council have doubtless exercised a wise discretion in refraining from any attempts to force on the erection of the building under circumstances which might perhaps have occasioned serious embarrassment to the Institute.

I may be permitted, however, to express the hope, that with the improvement in the financial condition of the country, which I trust we are justified in anticipating, the means at our disposal will also be so far increased as to allow of our setting about the work in earnest. We should bear in mind that one of the principal objects which the founders of this Society proposed to themselves, was "the formation of a museum for collections of models and drawings of machines and constructions, new inventions and improvements, geological, mineralogical, and zoological specimens, and whatever may be calculated, either as natural productions or specimens of art, to promote the purposes of science and the general interests of society." I need scarcely say that the very limited accommodation afforded us by our present rooms almost forbids anything like a satisfactory arrangement of the specimens and models we already possess, and is certainly a very serious hindrance to the enlargement and extension of our collections.

But although we cannot as yet point to spacious halls and handsome lecture rooms as material evidences of the Society's prosperity, we can with confidence refer to these *sure* tests of its growth and vigor, the number and character of the original papers and communications read at our weekly meetings, as well as of those which have appeared from time to time in the pages of the *Journal* of the Institute.

In congratulating you, however, as I justly may, on these evidences of the general progress and satisfactory condition of the Institute, I would at the same time avail myself of this opportunity to urge upon the attention of the members of the Society at large the complaint which has so repeatedly been made by former Councils, and which has been reiterated again in the Report submitted at our last annual meeting—that it is still a matter of regret that so large a share of the business of the Institute, so far as regards the contributions to the *Journal*, should continue to fall upon a few individuals. To the conductors of the *Journal* the members of this Society are under very large obligations. The high character which it has obtained under the

able management of the editor and the editing committee, has reflected honor upon the Institute, and has been one of the chief means of making the society known beyond the limits of the Province, and of establishing for it something more than a mere local reputation. I think therefore that a sense of gratitude to those who have labored so zealously and effectively, should incite us each in our several degrees to assist in the work, and I would join with the Council in earnestly inviting a more active co-operation on the part of the members generally, both in contributing to the *Journal*, and to the subjects for discussion at the weekly meetings.

I may fairly presume that it is the earnest desire of every Canadian that his country should at least keep pace in its intellectual progress with its growth in wealth and advancement in material prosperity; and we can doubtless point to our colleges and universities to prove that we have not been unmindful of the claims of letters, and that the generation, not yet passed away, which found Upper Canada a wilderness, and by their energy and industry converted it into a thriving and populous Province, were not so absorbed in the mere material interests of the day, as to preclude their taking thought for the higher interests of learning and science. But, admitting all this, it can scarcely be denied that the study of the physical sciences has, until very lately, made but comparatively little progress in Canada, and if we would establish for our country an honourable standing in the world of science, it behooves us to use our best exertions to aid and foster those associations which tend to encourage a spirit of enquiry, awaken a taste for scientific pursuits and investigations, and assist in promoting those observations and experiments which but for some such organization would perhaps never be made. Now in this Institute we possess just such *an organization* as we require—*a centre* into which the treasures gleaned by the experience, the observation, and the discoveries of active and intelligent minds amongst us, should naturally flow, to be there digested and arranged, and thence again diffused throughout the length and breadth of the land.

In this wondrous age of mental activity and scientific research, we need to task all our energies to keep pace with the progress of discovery. Every year new fields are thrown open for the researches of the geographer, the naturalist, and the geologist. Countries hitherto almost inaccessible, either from the natural obstacles which interposed themselves to their exploration, or rendered so by the jealous restric-

tions imposed by their governments, are, one by one, yielding to the perseverance of explorers, or the skill of diplomacy.

That great empire whose rulers have for ages jealously and systematically excluded every "outside barbarian" from all but the very threshold of its dominions, has at length been thrown open to the nations of the West; and China, with its immense territories stretching from the centre to the eastern extremities of Asia, is now accessible to the researches and investigations of those whose love of science or desire for adventure may prompt them to turn their steps thitherward.

The past year has witnessed, too, the landing of a British admiral and British ambassador at the capital of another country, for many ages almost a sealed book to the nations of Europe. The island empire of Japan—"the Zipangu" of whose wealth and civilization Marco Polo wrote in such glowing terms more than five centuries ago—has once more opened her ports, and allowed the adventurous Englishman to enter.

In Central Africa and Australia our explorers are continuing their researches with unabated vigor, and while gaining fresh laurels for geographical science, we may trust that by their discoveries they are gradually preparing the way for the introduction into the dark regions of the earth of the inestimable blessings of Christianity and civilization.

If we turn now to the progress of discovery in the regions of science, what vast results have followed the researches of those who have been laboring in fields hitherto unexplored or but imperfectly known. During the last few years physical science in all its branches has been advancing with gigantic steps, and enlarging its domain, not only by the discovery of much that is new, both in facts and in the laws which govern them, but by the correction of former errors, and the unceasing improvements in the methods and instruments of enquiry; and science is now made to yield practical results to the uses of man much more largely than heretofore. The development and progress of chemistry, geology, palæontology; the inventions and practical applications of photography and telegraphy—how marvellously have they increased, and to what perfection have they been carried!

Few amongst these inventions have made more rapid strides, or achieved results more interesting, even to the non-scientific portion of the community, than photography. During my late visit to England and the continent, I had frequent opportunities of examining and collecting specimens of this most beautiful art; and of the various exhibi-

tions and galleries which annually open their doors and display their treasures for the improvement and delight of the thousands who throng to the great metropolis of England, I know of none more interesting than the Photographic Exhibition, which has now become an annual one, and taken rank as such among the regular exhibitions of the year.

But photography does not content itself with ministering to the pleasure of the lovers of art; it has become the active handmaid of science,—giving to the astronomer faithful portraits of the heavenly bodies—to the zoologist and botanist the most accurate representations of the most complex subjects in their various departments—representations such as the ablest draughtsman could not furnish them with, in which the most minute peculiarities of form and structure are so wonderfully reproduced, that, as has been observed, "naturalists might even make discoveries upon these faithful images of nature, as they could have done upon nature itself." Nay, to such perfection has this art been brought, that the most transitory objects, even to the portrait of a shell while in full flight from a mortar, has been faithfully registered: the photographic eye being "more sensitive than the living one, and registering impressions too fine for human vision!"

Of that most wonderful of all the modern applications of science, the electric Telegraph, I am sure I shall be excused for quoting the remarks made by Professor Owen, in reference to it, in the course of his admirable address to the British Association. After referring to the discoveries in electro-magnetism, the Professor says: "Remote as such profound conceptions and subtle trains of thought seem to be from the needs of every-day life, the most astounding of the practical augmentations of man's power has sprung out of them. Nothing might seem less promising of profit than Oersted's painfully pursued experiments with his little magnets, voltaic piles, and bits of copper wire;—yet out of these has sprung the electric cable! Oersted himself saw such an application of his convertibility of electricity into magnetism, and made arrangements for testing that application to the instantaneous communication of signs through distances of a few miles. The resources of inventive genius have made it practicable for all distances, as we have lately seen in the submergence and working of the electro-magnetic cord connecting the old and the new world. On the 6th of August, 1858, the laying down of upwards of 2,000 nautical miles of the telegraph cords connecting Newfoundland and Ireland was successfully completed,

and on that day a message of 31 words was transmitted in 36 minutes along the sinuosities of the submerged hills and valleys forming the bed of the great Atlantic. This first message expressed 'Glory to God in the highest; on earth peace, good will towards men.' Never, since the foundations of the world were laid, could it more truly be said, 'The depths of the sea praise him!' "

Since these eloquent lines were penned this great triumph of modern science has received a check in the temporary failure of the cable, but the scientific problem has been satisfactorily solved, and the practicability of the scheme established beyond all doubt. Even we in Canada have had proof of the successful working of this wondrous agency; for among the messages transmitted during the too brief period of the Company's operations, was one countermanding the order for the embarkation of troops from Canada for India, upon the receipt of the intelligence at home that a great check had been given to the Indian Rebellion.

For the ultimate success, then, of this great enterprise, we need have no fear; the perseverance and energy of its promoters must overcome all obstacles, and, with the Divine blessing on their labors, we may hope, ere this year is out, to see the electric chain once more uniting the old and the new world.

Let us turn now to our own country, and see what progress we in Canada have been making during the past year; how far we have borne a part in advancing the outposts of science, or added in any way to the general stock of knowledge: and, first, I would call your attention to the contributions which have lately been made to our knowledge of the geography and natural characteristics of a part of North America hitherto but very imperfectly known. For some time past the attention of the people of this country has been drawn to the consideration of the practicability of establishing a direct communication between Canada, the Red River settlement, the valley of the Assiniboine, the Saskatchewan, and the British possessions on the Pacific; and a Company has already been chartered with very extensive powers, under an Act of the Provincial Legislature, for the purpose of opening up this communication. The route which I believe it has been *proposed* to follow, would lead from the shores of Lake Superior to Red River, from Red River to Carleton House on the Saskatchewan, from Carleton House to Edmonton House at the head of navigation on the Saskatchewan, and thence across the Rocky Mountains to the

head waters of Fraser River, and down it to the gold fields of British Columbia. This project is unquestionably one of great national interest, not only as respects Canada, but the whole British empire ;—for should its feasibility be thoroughly established, and it be found practicable to form a communication by Railway and Steamer between the head waters of Lake Superior and the shores of the Pacific, it would make Canada the highway to India and China, give to Britain the shortest route, and that within her own territories, to her possessions on the Pacific and her vast dominions in India, and open a highway for her commerce with the far East, with which no hostile power could interfere.

Meanwhile the government of Canada have, as you are all aware, taken steps to obtain reliable information as to the nature and capabilities of the country between Lake Superior and Red River, and there has lately been printed, by order of the Legislative Assembly, a very full and interesting Report of the exploration of that country, drawn up by the gentlemen who composed the expedition sent out for that purpose. The primary object of the expedition, as set forth in the instructions given to the party, was to make a thorough examination of the tract of country between Lake Superior and Red River, by which might be determined the best route for opening a facile communication through British territory from that Lake to the Red River settlement, and ultimately to the great tracts of cultivable land beyond them. The gentlemen to whom the task of exploration was committed appear to have done their work thoroughly, and to one among them, more especially, are we indebted for a large amount of most valuable and interesting information in respect to the soil, climate, geological formation, and natural history, both of the tract of country intervening between Lake Superior and Fort Garry, and the valleys of the Red River and the Assiniboine. I need scarcely say that the gentleman to whom I allude is Professor Hind of Trinity College, the geologist and naturalist to the expedition, whose connexion with the Institute, of which he has so long been a most valuable and efficient member, must increase the interest which all of us feel in his labors and researches.

Nothing, I think, shows more strongly the value of careful systematic observation, when conducted by properly qualified persons, than the statements contained in Professor Hind's Report with respect to the soil and climate of the valleys of the Red River and

the Assiniboine, as compared with the popular ideas on tehse subjects.

Hitherto these districts have been regarded, by the majority of the people of Canada, at all events, as most uninviting to settlers, not merely by reason of their distance from civilized life, but from the inhospitable nature ascribed to the climate, and the difficulty of raising the roots and cereals grown in our more favored country.

Even to the better informed amongst us, I think it will be a matter of surprise to learn that the summer of Red River is nearly four degrees warmer than the summer at Toronto, as ascertained by a comparison of corsesponding observations; and that in the district of Assiniboia, wheat, oats, barley, Indian corn, hops, flax, hemp, potatoes, and all kinds of garden vegetables, succeed admirably; and Professor Hind asserts that the potatoes, cauliflowers, and onions, he has not seen surpassed at any of the Provincial Fairs. From the statistics furnished by Professor Hind, there appears to be no doubt of the perfect adaptation of the climate of the valley of the Red River to the ordinary purposes of husbandry.

It is true that the prevailing characteristic of the winter months is long continued, intense cold, the temperature being 26 degrees lower than the temperature of Toronto; but, on the other hand, the temperature in spring is only 2 ° 83 lower than with us; that of the autumn, 6 ° 94; while the summer, as I before stated, shows an excess of 3 ° 78; so that the mean of the spring and summer months at Red River is nearly one degree higher than the corresponding months at Toronto. Added to this, the much greater rain fall, being 27 ° 74 inches more during the summer months than at Toronto, produces a wonderful richness in the vegetation, and, combined with the absence of late spring or early autumn frosts, renders the whole district peculiarly favorable for agricultural operations.

Now that the practicability of establishing a direct communication between Toronto and the Red River has been proved, the tide of emigration must soon be directed to those vast regions, even should the more magnificent scheme of Railway and Steamer communication to the Pacific and the rich gold fields of British Columbia be much longer in realization.

In the meanwhile, we in Canada are under no small obligations to those gentlemen whose explorations have already furnished us with so much valuable information, and I believe I am correct in stating

that a still fuller and more interesting report, embracing an account of his exploration of the valley of the Saskatchewan, may soon be looked for from the pen of Professor Hind.

In connection with this subject I may be permitted to allude for a moment to a forthcoming work from the pen and pencil of a Canadian artist and a member of the Institute, Mr. Paul Kane, which promises to afford much new and interesting information with regard to the countries between this and the Pacific. During his travels through these countries, Mr. Kane amassed not only a great deal of valuable information relative to the customs, manners, and habits of the various Indian tribes, but made also a vast number of most interesting sketches; and I have lately had the pleasure of seeing some of the chromo-lithographic drawings taken from these sketches, and intended to illustrate the letter-press of his work, which will shortly be brought out in London. I am sure I may safely say that the book will be hailed by both the Canadian and English public, as a most timely addition to the scanty knowledge we as yet possess of a quarter of North America which is now beginning to awaken so much interest in the minds of all.

In geological science, Canada, thanks to the labours of Sir William Logan and his able coadjutors, must always hold a place of honor. Indeed it may safely be asserted that the geological survey has done more for the reputation of Canada among intelligent and scientific men abroad and in England, than anything else connected with the country. The Report of the survey published last year is full of most interesting matter, and includes the Report of Sir William Logan on the distribution of the crystalline limestones in the Laurentian rocks of Grenville, Harrington, and the adjacent Townships in Eastern Canada; Mr. Murray's Report of his explorations in the country lying between Lake Huron and the Ottawa River; four Reports by Professor Sterry Hunt of his investigations of the lime-feldspar rocks, and their associated minerals of the Laurentian formation; Researches on the composition of the waters of the Ottawa and St. Lawrence; Examinations of the serpentines and other metamorphic rocks of the Eastern Townships, and of a series of traps and intrusive rocks. Mr. Richardson's Report relates to an exploration of the Island of Anticosti; and a Review of the palæontological relations of the Anticosti rocks, with a descriptive list of various new species of organic remains, constitute the subjects treated of in the Report of Mr. Billings.

There has also just been issued a separate and very interesting volume, containing figures and descriptions of Canadian organic remains. The descriptive part is by Mr. Billings, the palæontologist of the Geological Survey of Canada; Mr. J. W. Salter, one of the palæontologists of the Geological Survey of the United Kingdom; and Mr. T. R. Jones, Assistant Secretary of the Geological Society of London. The plates, which are beautifully executed, are all the works of first-rate artists, and the whole work will prove a most valuable addition to the scientific information which the geological survey has been the means of furnishing in relation to the palæontology of Canada.

In the departments of zoology and botany, the Natural History Society of Montreal continues, as in former years, to labor zealously and effectively, and in the pages of the Magazine, edited by a Committee of that Society, the Canadian student will find much valuable information relating to the zoology and botany of his country.

And here I cannot refrain from alluding to some remarks which I recollect having met with in the September number of our own *Journal*, upon the very great desirableness of having a zoologist and botanist attached to our geological survey. With the writer's suggestions I most heartily agree. Both the flora and fauna of this country have as yet received but little attention from scientific men as compared with the research and labor which have been so well bestowed upon its geological features.

The destruction of our forests, and the rapidly progressing settlement of the country, will soon render it difficult to obtain specimens, or to observe the habits of many of the wilder and rarer species of our quadrupeds and birds. With the former more especially, the destruction of their usual haunts in the depths of the forests will soon be followed in many cases by the almost total extinction of the species, and when perhaps, at a later day, this deficiency in our scientific staff has been filled up, the golden opportunity will have passed away.

I trust therefore that the members of the Institute will permit me to urge these considerations upon their attention, and that some steps will be taken by the Society with the view of bringing the matter at some future day under the notice of the Provincial Government.

Passing from this subject, I am naturally led to the consideration of our own position in respect to the aid which we receive in the shape of pecuniary support from the Provincial Government; and while I would record the grateful sense which I, in common, I am sure, with

all my fellow-members, entertain of the long continued liberality of the Government towards us, I cannot help expressing my regret that it has been deemed advisable to withdraw the grant formerly made to the Toronto Athenæum, and which we have enjoyed since the amalgamation of the two institutions. The depressed state of the financial affairs of the country, and the consequent necessity for a strict economy in the expenditure of the public moneys, induced the Government, I suppose, to limit their liberality last year to the grant of £250, but I hope that it will not be found necessary to confine it to that amount hereafter.

I cannot but regard a liberal appropriation from the public funds for the purpose of aiding and supporting societies having for their objects the advancement of science and the spread of knowledge, as a wise and judicious act on the part of any government, and with reference to this point I trust you will pardon my again quoting from the excellent address of Professor Owen, to which I have already alluded. In that part of it in which he alludes to the aid and countenance which the British Government had always given to science and scientific institutions, he proceeds to show how science makes *return* to governments for fostering and aiding her endeavours for the public weal:

" Every practical application of the discoveries of science," says the Professor, " tends to the same end as that which the enlightened statesman has in view. The steam engine in its manifold application, the crime-decreasing gas lamp, the lightning conductors, the electric telegraph, the law of storms, and rules for the mariner's guidance in them, the power of rendering surgical operation painless, the measures for preserving public health, and for preventing or mitigating epidemics—such are among the more important practical results of pure scientific research, with which mankind have been blessed, and states enriched. They are evidence unmistakeable of the close affinity between the aims and tendencies of science, and those of true state policy. In proportion to the activity, productivity, and prosperity of a community, is its power of *responding to the calls of the Finance Minister*. By a far seeing one, the man of science will be regarded with a favorable eye, not less for unlooked for streams of wealth that have already flowed, but for those that may in future arise out of the application of the abstract truths, to the discovery of which he devotes himself."

I think, then, it will be readily conceded, that to maintain and advance the interests of associations formed for the promotion and encouragement of scientific pursuits, and the spread of general knowledge, is clearly an act of enlightened patriotism on the part both of the government and the people. It behooves us, therefore, while looking for a continuance of that fostering aid which has hitherto been liberally accorded to us by the government of the country, to take good heed that we are faithful to the trust committed to us, and labor, each of us according to our ability and opportunity, to promote the ends for which this Institute was established.

In every association of this kind there must always be a large class of members who have neither time nor opportunity for contributing much information on scientific or literary subjects, and who have joined the society more, perhaps, for the sake of aiding and encouraging an institution which they believe to be both a desirable and useful one for the country, than with any idea of ever taking an active part in its proceedings. But even these persons, at the cost of but little personal exertion, can render many important services. Every one has it in his power to observe; and would we but make good use of the faculties with which God has blessed us, we should find that each could contribute something to the general stock of knowledge.

And, lastly, the objects of our weekly meetings, be it remembered, will be very inadequately fulfilled, if they simply afford to our members an agreeable and intellectual mode of passing an evening. We seek, by the papers which are there read, and by the discussions which are invited, to awaken a spirit of enquiry, to excite and encourage the desire for the acquisition of knowledge; and, by the influence of mind upon mind, to awaken those tastes and aspirations which may lead us in *some degree* to aim at being fellow laborers with those great men who, while they are advancing the triumphs of scientific discovery, and enlarging the boundaries of knowledge, are conducing at the same time to the progress and the happiness of mankind.

ON THE FOSSIL CORALS OF THE DEVONIAN ROCKS OF CANADA WEST.

BY E. BILLINGS, F. G. S.

Read before the Canadian Institute, February 26th, 1859.

The following paper contains notices of forty-three species of corals collected in the Devonian rocks of Canada West, being all that I have seen that are sufficiently well preserved to admit of description. Besides these there are in the large collection of the Geological Survey a great many specimens in a fragmentary condition which appear to belong to eight or ten other species. The total number of Devonian corals known in Canada may be estimated at about fifty. It is highly probable that a few more may be discovered, but I do not think the total will ever much exceed sixty species.

Of the forty-three species described in this paper, the following six occur in the Devonian formation in Europe:—*Favosites Gothlandica, F. hemispherica, F. basaltica, F. cervicornis, F. polymorpha,* and *Heliophyllum Halli. Favosites Gothlandica* is the only species that occurs in both Silurian and Devonian rocks.

It is worthy of particular notice that no species of *Cyathophyllum* have yet been found in Canada, while the genus *Heliophyllum* affords six species. My own impression is that this latter genus is only a section of *Cyathophyllum,* although in deference to the opinions of others I have recognized it as distinct.

In designating the formations I have used the term "CORNIFEROUS" as including both the Onondaga and Corniferous limestones of the New York Survey. All the species, except two, occur in this group of rocks. Only a few fossils have been collected in the Hamilton group, in Canada; and if any increase should hereafter be made in the number of species of Devonian corals, it is from these rocks they will most probably be procured.

Genus FISTULIPORA (McCoy).

(McCoy. *British Palæozoic Fossils,* p. 11.)

Generic Characters.—"Corallum incrusting, or forming large masses, composed of long, simple, cylindrical, thick-walled tubes, the

mouths of which open as simple, equal, circular, smooth-edged cells on the surface, and have numerous transverse diaphragms at variable distances; intervals between the tubes occupied by a cellular network of small vesicular plates, or capillary tubules traversed by diaphragms."

This genus has no radiating lamellæ, a character which constitutes the only difference between it and *Heliolites* (Dana).

FISTULIPORA CANADENSIS (Billings).

FISTULIPORA CANADENSIS. Billings. *Geo. Sur. Canada, Rep. for* 1857, p. 165; *Can. Nat. and Geologist*, Vol. III. p. 420.

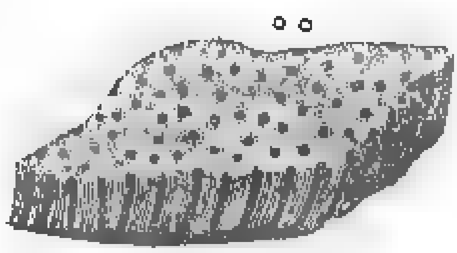


Fig. 1. *Fistulipora Canadensis.*

Corallum forming sub-pyriform, irregular, contorted masses, or wide, flat, undulating expansions or layers, from one-half of an inch to one inch in thickness, which are based upon a thin, concentrically wrinkled epitheca. Cell-tubes half a line or less in diameter, and about one line distant from each other; the mouths of the tubes protruding a little above the general surface. Transverse diaphragms thin, horizontal or flexuous, and sometimes very numerous, there being in some of the tubes three or four in half a line of the length of the tube. The intercellular tubules are polygonal, and about four in the diameter of one of the principal cells; their transverse diaphragms are well developed, usually four or five to one line of the length.

F. Canadensis differs from the other described species in the following respects:—From *F. decipiens* (McCoy) in having the cell-tubes more distant and the diaphragms more numerous, and from *F. minor* (McCoy) in the same particulars, the cell-tubes of the latter species being still smaller and closer together than in *F. decipiens*.

This coral much resembles *Heliolites porosa* (Goldfuss), but can be readily distinguished by the absence of the radiating septa.

Locality and Formation.—Devonian; Corniferous or Onondaga limestone; lot 6, con. 1, Township of Wainfleet; at the east end of Lake Erie.

Genus Favosites (Lamarck).

Generic Characters.—Corallum dendroid, or forming pyriform convex or depressed hemispherical masses, composed of polygonal slender corallites, which are divided transversely into numerous compartments by complete or incomplete diaphragms. Walls, with one or more rows of circular pores forming communications between contiguous cells. Radiating septa, represented by series of small tubercles or short spines.

The genera *Emmonsia*, of Edwards and Haime, and *Astrocerium*, Hall, appear to be identical with *Favosites.*

Favosites Gothlandica (Lamarck).

This species, which no doubt should be regarded as the type of the genus *Favosites*, was established, as its name implies, upon specimens procured from the island of Gothland, in the Baltic Sea, where it occurs in a coralline limestone, that is known to be the equivalent of the Wenlock rocks of England, and of the Niagara group on this continent. Although more abundant, and more often quoted by geologists, than any other species, yet we know of no palæozoic coral concerning which there exists so great a diversity of opinion. Indeed, so variously has it been defined by the best authors, that, without much comparison and fusing of differences, it is hardly possible to show that it includes any of our Devonian specimens. The following are the descriptions of several of the leading palæontologists:

1st. Goldfuss. *Petrefacta Germaniæ*, Vol. I., p. 78; Pl. 26, Fig. 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, 4 *d*, 4 *c*.

This distinguished author describes the species as being globular or placentiform, with prismatic tubes either sub-equal or with smaller ones interposed; transverse diaphragms flat; communicating pores in two rows.

He does not give any measurements, and we are therefore obliged to rely upon his figures for the dimensions of the tubes. They are as follows:—In fig 3 *a*, which is generally admitted to be a very characteristic form of the species, the tubes are, upon an average, one and a half lines in diameter, some of them being two lines and others only one line. This is important, because, as we shall see hereafter, the species is described by several palæontologists as having the cells only one line wide, upon an average. In this figure two rows of pores are represented, those of the same series being distant from each other

about half a line. In general they are opposite, but in some places those of one row alternate with those of the other. In fig. 3 *e*, which represents a portion of the specimen a little enlarged, the pores are placed alternately, and surrounded by a narrow elevated rim. The faces of the tubes exhibit a few scattered tubercles, which, according to Edwards and Haime, represent the radiating lamellæ in a rudimentary state. In fig. 3 *c*, the average width of the tubes is about one and a quarter lines, and in 3 *d*, the same. In 4 *c*, which Goldfuss refers to *F. basaltica*, most of the tubes are one and a half lines in diameter, with a few very small ones interposed. In 4 *d*, which is an enlargement of a portion of 4 *c*, two of the faces exhibit a single row of pores, but upon a third face there appear to be two series, one of which however is but imperfectly shown, as it is much obscured by the shading of the drawing. Specimens agreeing well with this figure, are common in the Devonian of Canada West. The other figures given by Goldfuss exhibit tubes one and a half lines in diameter on an average. He also states that one of his specimens came from Drummond Island. (*Ferner kommt sie auch, nach einem Exemplar der Akademischen Sammlung auf Drummond-Island vor.*) The specimen must have been therefore collected from the Niagara limestone, which we know to be the most recent rock of that locality.

2. EDWARDS and HAIME. *Polypiers fossiles des Terrains Palæozoiques.* p. 233.

These authors describe *F. Gothlandica* as consisting of convex somewhat elevated masses, with tubes a little unequal in size, each having ten or twelve radiating septa, represented by spiniform tubercles. On each face of the tubes two series of pores, each pore surrounded by a small elevated border; the pores of the same series a little more distant than is represented in the figures of Goldfuss.—They alternate a little with those of the neighboring series, and the spiniform tubercles representing the radiating septa more numerous and prominent than they are shewn to be by the same author. Diameter of the large tubes, three millemeters, or one line and a half.

In another work, BRITISH FOSSIL CORALS, Palœontographical Society's publications, Edwards and Haime describe the species in the same general terms, but state that the breadth of the calices is "somewhat more than one line." They consider *F. Niagarensis*, Hall, to be *F. Gothlandica*, and also deny that this latter species occurs in the Devonian.

3. PROF. McCOY, *British Palæozoic Fossils*, p. 20.

Pofessor McCoy thus describes *F. Gothlandica*,—"Corallum forming irregularly pyriform or very large circular, slightly convex masses, with concentrically wrinkled base, composed of polygonal tubes, averaging one line in diameter when adult, (but with occasional large irregular spaces, in which the diameter is only half a line,) with very numerous young smaller interpolated columns, of smaller diameter, and fewer angles; transverse diaphragms flat, about three in the space of one diameter; external walls as exposed in rough vertical fracture, slightly roughened by small transverse wrinkles, which obscurely crenulate the edges, sides with one or two rows of large round communicating pores.

"I agree with Mr. Lonsdale, in thinking that the *Favosites absaltica*, (Goldf. Sp.) characterised by having but one row of pores on each face of the tubes, should be viewed as only a variety of this species; as I think I have seen from one to three rows in portions of a single mass.

"Specimens from Gerolstein, in the Eifel, seemed to agree (on the most careful comparison of good specimens) perfectly with the silurian ones from Wenlock, and the carboniferous ones from Derbyshire. The great number of the young tubes gives a peculiar irregularity of aspect to the surface of this species."

It will be perceived by the above how widely the best palæontologists differ in their descriptions of *F. Gothlandica* upon the same very important point, the width of the corallites or tubes. According to Professor McCoy, they are upon the whole less than one line in diameter; the adult cells, or the largest, only reaching that size, while there are a great many much smaller. From Edwards and Haime we learn that they are over one line, while by the figures of Goldfuss they are shewn to be full one line and a half, the tubes above that size being more numerous than those below. This diversity might not appear to be of much consequence, and yet those geologists who have had occasion to work a good deal among rocks abounding with these corals know that the difference of half a line in the average size of the tubes in two specimens of *Favosites* gives to them a very dissimilar aspect, and strongly suggests the idea of two species. The more, however, we examine into the subject the more evident does it become that mere difference in size is not sufficient to separate species unless the internal structure also differs. At all events the above comparison

demonstrates to us the very weighty fact that in Europe *F. Gothlandica* is found to be variable in the character that is most generally relied upon as a means of identifying the species.

In order to ascertain whether or not our Canadian forms could be divided into several species, I undertook to write out a detailed description of each specimen in the large collection of the Geological Survey, noting the following characteristics:—1st, the diameter of the tubes. 2nd, the form of the diaphragm, and their structure, whether complete or incomplete. 3rd, the presence or absence of the spiniform tubercles. 4th, the number of rows of pores. 5th, the distance of the pores from each other. 6th, the presence or absence of the elevated border around the pores. 7th, the presence or absence of longitudinal lines or striæ on the faces of the tubes. The specimens were from Anticosti, Cape Gaspé, the coast of the Bay of Chaleurs, the Eastern Townships, the head of Lake Temiscamangue, the Niagara ridge, Drummond Island, and various localities of Devonian rocks in Canada West. It would be too much to give even a small portion of the details in this paper, and I shall therefore state briefly the principal results.

1st. The size of the tubes in all those specimens which have the internal characters of *F. Gothlandica* is variable, and ranges from three fourths of a line to a little more than two lines.

2nd. The greater number have the tubes between one line and one line and a half in width.

3rd. There are more specimens above one line and a half in the Devonian than in the Silurian.

4th. The diaphragms may be complete or incomplete in the same specimen, or in different parts of the same tube. This character is more common in Devonian than in Silurian specimens, and more so in the lower than the upper Silurian.

5th. The spiniform rays exist in both upper Silurian and Devonian specimens, but have not been observed in the lower Silurian.

6th. The pores are usually in two series, but specimens with one, two, or three rows, are not uncommon in both the upper Silurian and Devonian rocks. I have seen no pores in the lower Silurian specimens.

7th. The elevated border around the pores occurs in both Silurian and Devonian forms, and in the same specimen may be absent from one part and present in another.

8th. The pores are usually distant half a line from each other, but sometimes either less or more than that distance.

9th. The longitudinal lines on the faces of the tube may be either present or absent, in different parts of the same specimen, and it is in general much more strongly developed in the Devonian than in the Silurian rocks. I have seen it on European specimens.

If the observer, while examining any large collection of specimens from the upper Silurian or Devonian rocks of Canada, keep in mind and direct his attention to the investigation of the above characters, he will find innumerable shades of difference which will soon convince him that if they are to be regarded as of specific value, it would require nearly fifty specific definitions to give them all expression. It is scarcely necessary to state that a division to one-fourth of that extent would be absurd, and injurious to science. The species which I believe to have been too unguardedly set apart from *F. Gothlandica* are *F. Goldfussi, F. Troosti, F. Niagarensis, Astrocerium parasiticum,* and *A. pyriforme.*

The first of these, *F. Goldfussi,* (Edwards and Haime), was supposed to be different from *F. Gothlandica,* because although there were in general two rows of pores, yet some of the sides of the tubes exhibit one, and others three rows, and further that the pores are nearer together than in the typical species. I am perfectly satisfied that neither of these characters are sufficient.

F. Troosti, (Edwards and Haime.) Founded on the presence of the longitudinal lines on the faces of the tubes, is also not distinct, as that character occurs throughout the series.

F. Niagarensis, (Hall,) is thus described :—"Spheroidal or irregular in form, rapidly increasing by interstitial cells; walls of cells usually thin, pierced by two rows of minute pores; transverse septa thin, often oblique, or bent downwards." Professor Hall further states that it "differs from the *F. Gothlandica* in forming more usually small spheroidal masses, and in the rapid increase of cells almost entirely by interstitial growths, the base continuing small. The size of the cells is always less than in that species, and from this character alone it may be distinguished."

I think that this species consists of young pyriform or spheroidical colonies of *F. Gothlandica* or *F. basaltica,* and also that the other two *A. parasiticum* and *A. pyriforme* are the same. Wherever *F. Gothlandica* and *F. basaltica* occur, these small specimens are more or less common.

It may be that *F. Gothlandica* is capable of subdivision into the above and perhaps many more species. I think it highly probable that species may be so closely allied that the boundary lines between them are not perceptible to our senses, and in such cases, although we may strongly suspect that they are distinct, yet it is not philosophical to proceed by giving them names before we have observed the natural limits by which they are separated.

In conclusion, therefore, I would propose to refer all the above mentioned species back to *F. Gothlandica*, there to remain until they are shewn by good persistent characters, actually observed and pointed out to be different. The description of the species should perhaps be as follows:

Description.—Corallum forming spheroidal, pyriform, or large hemispheric or flattened masses; corallites in general between one line and one and a half lines wide, sometimes less or more, often two lines; transverse diaphragms usually complete, rarely incomplete; mural pores in one, two or three series, usually two, those of the same series about half a line distant, sometimes less; pores surrounded by an elevated margin; faces of tubes with one or two longitudinal striæ, more or less distinctly developed; radiating septa represented by series of small spines, often in the rudimentary form of tubercles.

In general, the condition in which the specimens have been fossilized is such that the pores, the border round the pores, the longitudinal lines and septal spines have disappeared. Even in well preserved specimens these characters will often be absent from particular portions. The following figures are taken from a specimen in the cabinet of the Canadian Institute.

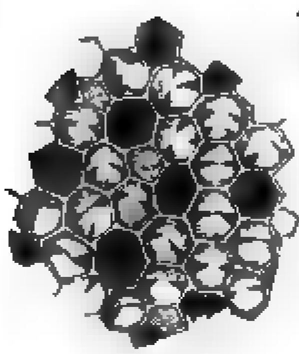


Fig. 4.

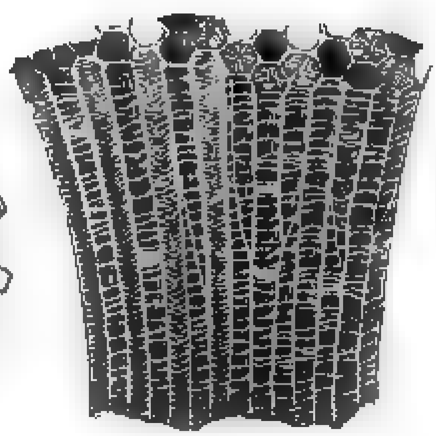


Fig. 2.

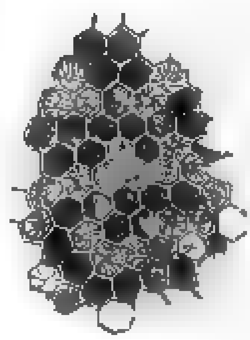


Fig. 3.

Fig. 2 exhibits several tubes, some of which have complete diaphragms, and others incomplete. In figure 3 the ends of the tubes of

a portion are represented, some of them with the septal spines fully developed, and extending nearly to the centre. If we are to adopt the several generic and specific names proposed for *F. Gothlandica*, the tubes with the radiating spines would belong to the genus *Astrocerium* of Hall, those with incomplete diaphragms to the genus *Emmonsia* of Edwards and Haime; the others with complete diaphragms would be referred to *Favosites*. We thus have all the characters of three genera in the same specimen. Fig. 4 represents part of a specimen in which the diaphragms are deeply indented in several places around the margin. This character has been relied upon as of specific importance, but as in this specimen there are numerous diaphragms perfectly flat, I do not think it belongs to a different species.

Locality and formation.—*F. Gothlandica* occurs abundantly in almost every large exposure of the corniferous limestone in Canada West. Fine specimens may be procured at the large quarry belonging to Mr. Savage, lot 6, con. 1, Wainfleet.

FAVOSITES HEMISPHERICA.—(Yandell and Shumard.)

FAVOSITES ALVEOLARIS. Hall. *Geol. of New York*, p. 157, No. 31, fig. 1, 1 *a*.

FAVOSITES HEMISPHERICA. Yandell and Shumard, *Contrib. to Geol. of Kentucky*, p. 7, 1857.

EMMONSIA HEMISPHERICA. Milne Edwards and Jules Haime. *Polypiers Fossiles*, p. 247, 1851.

Corallum forming large hemispheric or subspherical masses, sometimes two or three feet in diameter. Calyces irregular polygonal, and varying in size from half a line to a little more than one line.—Transverse diaphragms closely set, incomplete, or extending only half way across the tube, usually flexuous and irregularly interlocked along the centre of the corallite. Mural pores in one, two or three series, and when there are three the central row is usually the most conspicuous. Distance of pores from each other about one quarter of a line.

The only difference that exists between *F. hemispherica* and *F. Gothlandica* is, that in the one the diaphragms are always imperfect, and in the other nearly always complete.

This species occurs abundantly in the corniferous limestone in

many localities in Canada West. Very fine specimens may be collected at a quarry on lot No. 6, con. 1, in the Township of Wainfleet, about three miles from Port Colborne. The cells of the specimens are empty, and display all the characters of the interior as perfectly as could be desired. Near Woodstock it is found converted into a white crystalline limestone. The specimens are here also very good ones, but in order to observe the distinguishing peculiarity of the species, (the incomplete septa,) it is necessary to grind down the surface, so as to expose the inside of the tubes.

In England, *F. hemispherica* is found in the Devonian formation at Torquay; and in Spain at Contejo de Castrillon, near Aviles.

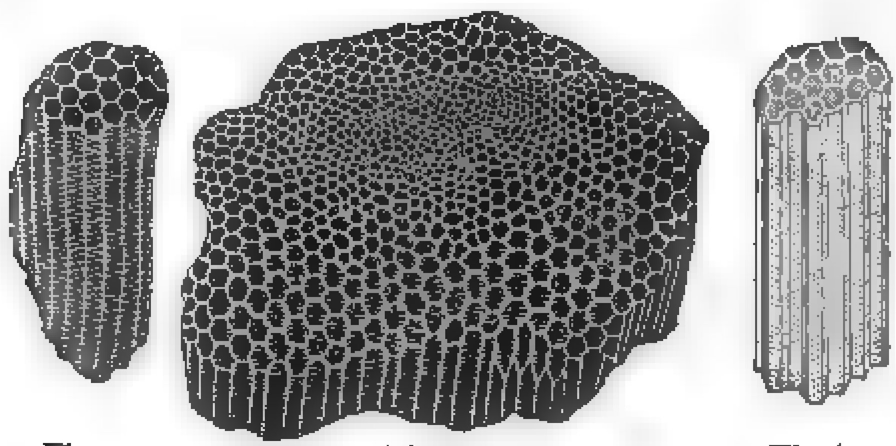


Fig. 6. Fig. 5. Fig. 7.

FIG. 5.—A fragment, selected to show the variation in the size of the tubes in different parts of the same specimen.

FIG. 6.—Shows the incomplete septa.

FIG. 7.—Specimen from near Woodstock, showing the pores.

FAVOSITES BASALTICA.—(Goldfuss.)

Corallum forming convex, subspherical or pyriform masses; corallites variable in size, and either all of nearly an equal width in the same specimen, or with many very small ones interspersed between the larger; transverse diaphragms thin, flexuous or flat, complete or incomplete; mural pores usually in one series. The width of the tubes varies from less than one line to two lines.

The specimens generally referred to this species have a pyriform or hemispherical shape, and small well defined polygonal curved tubes with one row of pores, rarely two. I think, however, that others with a very different shape should be added, for the following reasons:

In the original description given by Goldfuss he first states that the corallites are prismatic, but in the conclusion qualifies this char-

acter by observing, that in some instances, the transition from the angular form to the circular or cylindrical form, is so gradual, that it is difficult to detect the line of demarcation. One of his figured specimens was collected on the shores of Lake Erie; and as we have many from the same locality which are unquestionably of the same species as that represented by his figure 4 *a*, we have the means of knowing with all desirable certainty precisely what form he had in view when he prepared his description. Several of the specimens in the collection of the geological survey from lot No. 6, con. 1, Wainfleet, are small pyriform masses three inches in height, and gradually enlarging from a small base to the width of two inches in the upper part. The cells open out on the surface obliquely, in an upward direction, and, in fractured specimens, are seen to curve from the vertical central axis of the mass outwards. The large cells are one line or a little more in diameter, and the small ones of all sizes down to one fourth of a line. The inner surfaces of the cells are roughened by very numerous short projecting lamellæ, which appear to be the remains of the transverse diaphragms which have been destroyed along the central part of the cavity. This character, of course, can only be observed where the tubes are empty. The large tubes are often perfectly circular, but in general they are more or less polygonal, and surrounded by from five to nine smaller ones. On each face of the small tubes, there is a single row of pores. When the tubes are nearly equal, there are occasionally two rows of pores. I have not yet seen a border round the pores as in *F. Gothlandica*. In some of the tubes there are faint indications of longitudinal striæ. The figure 4 *a* given by Goldfuss does not exhibit the pores, but the roughened interior of the cells and aspect of our specimens is so perfectly represented, that there cannot be the least doubt as to the identity of the species.

Granting, therefore, that the small pyriform masses from Wainfleet are of the species intended by Goldfuss, and taking our departure from them as a starting point, there is, in the Museum of the Geological Survey, a perfect transitional series, from specimens two or three inches to large pyriform masses eight inches in height and six inches in diameter on the top. The cells in these large specimens are always large, and very unequal in size at the smaller or basal extremity of the mass, while above and on the top they become nearly equal, and are upon an average smaller than they are below. When such speci-

mens are broken to pieces, a fragment from the upper part has a very dissimilar aspect from another taken from the base, on account of the difference in the size of the tubes. The top of one of these large colonies would furnish specimens exactly like Goldfuss's figure 4 *c*, with cells of the same size, the same curve, and also with in general only one row of pores, while the upper surface unbroken would give 4 *b*. Thus, according to my view all three of Goldfuss's figures represent colonies of a single species. Edwards and Haime, however, have divided the species; referring specimens in which the cells are exceedingly unequal to *F. Forbesi*, and those wherein there is no great inequality to *F. basaltica*. Their description does not differ materially from that of Goldfuss, and it would be the better course not to separate the species until a distinction can be pointed out.

Returning to the small pyriform specimens, they can be traced in another direction through a gradually changing series to elongated cylindrical forms from one to two inches in diameter, and more than one foot in length. These transitions can only be proved by a good collection of such beautifully preserved specimens as are now in the Museum of the Geological Survey. Fig. 8 represents the first step in the passage from the cylindrical to the globose forms.

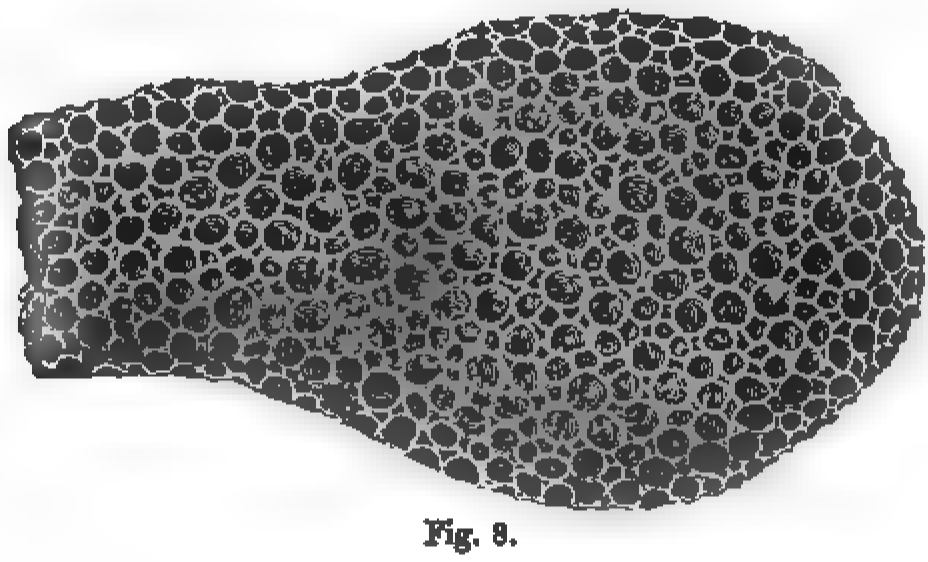


Fig. 8.

As I have already stated, it is in these small specimens that we observe in the extreme the inequality in the size of the corallites. In the large masses, the cells are more nearly equal, and smaller upon an average than the large cells in the smaller.

Notwithstanding all the above, I should not be at all surprised if evidence should be procured hereafter to prove that both *F. basaltica* and *F. hemispherica* are inseparable from *F. Gothlandica*. The

roughness of the inner faces of the tubes of *F. basaltica* above alluded to, may be the effect of some peculiar mode of fossilization, and should not be relied upon as a specific character; and I have seen some fragments which appear to be portions of large dome-shaped masses, that I could not distinguish from *F. Gothlandica* on the one hand, nor from the summit of a large specimen of *F. basaltica* on the other.

Locality and formation.—Rama's farm, near Port Colborne; near Woodstock; lot 6, con. 1, Wainfleet.

FAVOSITES TURBINATA.—(Billings.)

Corallum forming elongate turbinate masses, sometimes two feet in length and six inches in diameter, often curved at the base. Corallites nearly of an uniform size, usually somewhat less than a line in width; transverse diaphragms thin, flat, flexuous, complete or incomplete. Only one row of pores have been observed. Whole surface, except the upper part, covered by a strong epitheca which closes the mouths of the cells.

The distinguishing peculiarities of this species are:

1. The form of the colonies—which often resemble a huge, elongated straight or curved *Cyathophyllum*. Very small ones about the size and shape of *Zaphrentis prolifica* (see fig. 22, page 121) are not uncommon, but they are found of all dimensions up to two feet in length, and six inches in diameter. Some of them are straight and very obtuse, or suddenly enlarging at the base, becoming cylindrical above.

2. The cells are all closed, except on the top of the colony. It appears that the corallites had an average duration of vitality, at the end of which the polyp died, and the epitheca extended itself over and into the aperture, and completely closed it. In many specimens the edges of the disc which fills the mouth of the cell, retains the impressions of the radiating septal spines.

The above two characters appear to me so remarkable that I think this species new.

Locality and formation.—Rama's farm, near Port Colborne; lot 19, con. 3, Walpole; lot 30, con. 4, Cayuga. Corniferous limestone.

FAVOSITES CERVICORNIS.—(De Blainville.)

This species is one of those included by Goldfuss in his *Favosites polymorpha*. The specimen represented by fig. 9 agrees very well

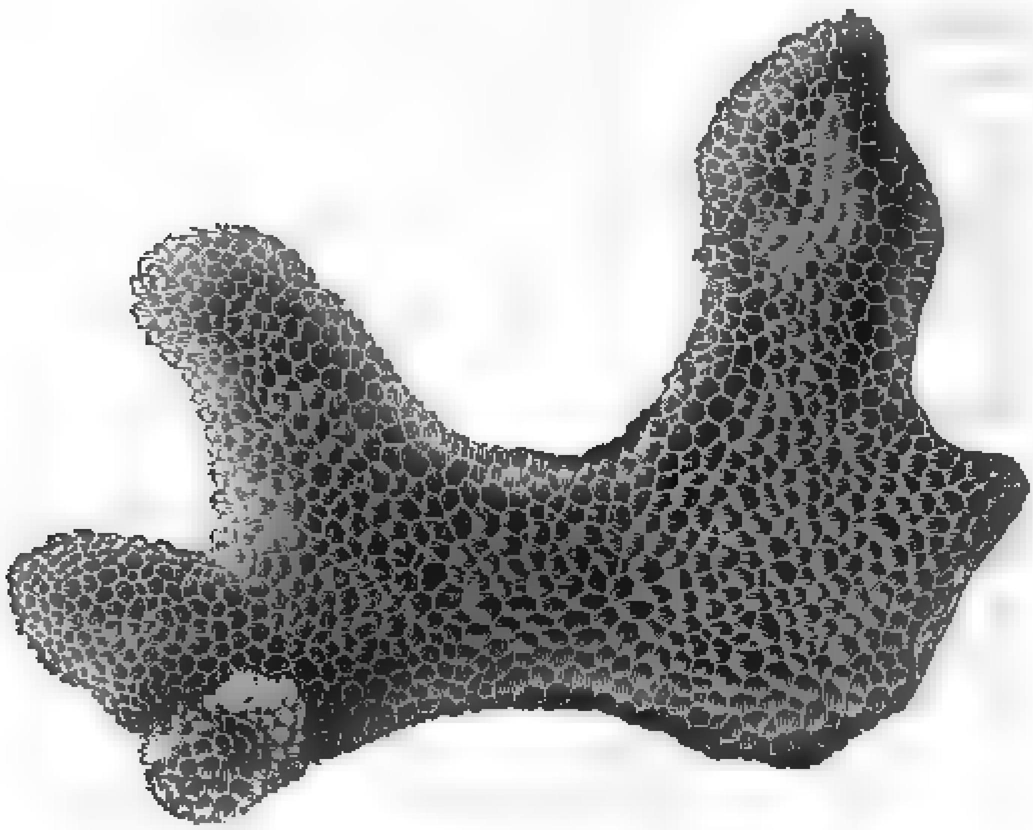


Fig. 9.—*F. cervicornis* from Wainfleet, C. W.

with those figured in the *Petrifacta Germaniæ*, pl. 27, and also with that of Edwards and Haime, *British Fossil Corals*, pl. 48, fig. 2. We have other specimens in which the cells are on an average from half a line to one line in width, which cannot be separated from the one I have figured. In some, the branches are nearly two inches in diameter, and in consequence of the thickening of the walls, the apertures of the cells are often perfectly circular.

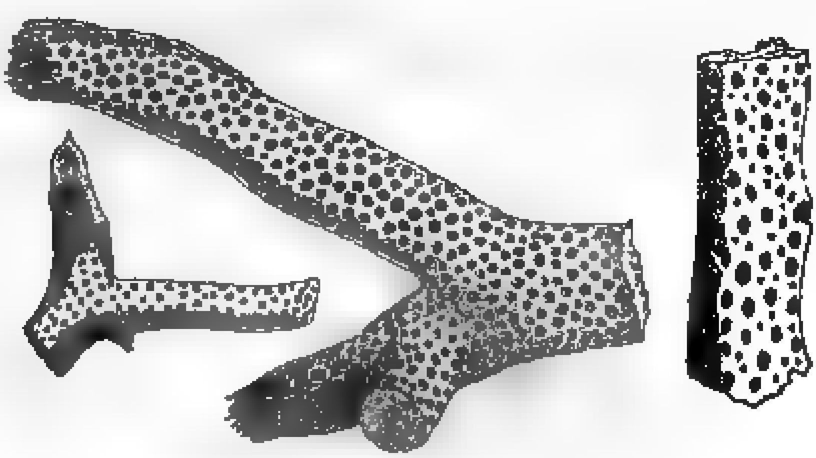
Locality and formation.—Rama's farm, lot 6, con. 1, Wainfleet, and near Cayuga, C. W.

FAVOSITES POLYMORPHA.—(Goldfuss.)

These small branching corals have been referred to several species supposed to be distinct by some authors, while according to Mr. Lonsdale and Professor McCoy, they all belong to one natural group, of which the proper appellation is *F. polymorpha*, Goldfuss. In their description of *F. reticulata*, *British Fossil Corals*, p. 216, Edwards and Haime, also have the following remarks :

"We have provisionally admitted as forming distinct species, various ramose Favosites which have previously been described as such by Blainville, but which may probably, when better known, be found to be only varieties of the same species. Such are *F. reticulata*, *F. cervicornis*, and *F. dubia*. The latter differs, however, from the first, by its branches not being coalescent, nor so closely set, and by the calices being rounded and obliquely placed on the surface of the branches. *F. cervicornis* has its calices more unequal in size, its walls thinner, and its branches longer and more irregular. All these have only a single line of pores on each side of the walls, and these pores are large, and placed at a distance from each other."

These authors have recognised *F. dubia* among specimens from Ohio; and in Canada all the forms represented in the European books occur. The branches occur of all sizes from four lines to one inch and a half in diameter. The walls of the corallites are often so greatly thickened that the apertures are distant from each other as in figures 11 and 12, which resembles *F. dubia* of Blainville, and the



Figs. 10, 11, 12.—Three forms of *F. polymorpha* from the corniferous limestone, Canada West.

variety *F. gracilis* of Goldfuss. Fine reticulated masses may be procured along the shores of Lake Erie near Port Colborne. The other forms are not uncommon wherever there is a large exposure of the corniferous limestone in Canada West. Although I have placed *F. cervicornis* separately, yet I am not satisfied that it is a distinct species.

Genus MICHELINIA.—(De Koninck.)

Generic Characters.—" Corallum compound, forming rounded, or conoidal masses of inseparably united, thick-walled, polygonal tubes

of large size, marked internally with numerous vertical lamellar striæ, and communicating pores; base of cells filled up by very irregular, numerous, highly inclined vesicular plates, not forming distinct horizontal diaphragms; external or basal epitheca of the general mass, strong, concentrically wrinkled, and sometimes spinose."—*McCoy, British Palæozoic Fossils, page* 80.

This genus differs from Favosites in the vesicular character of the transverse diaphragms, and in the radiating lamellæ being represented by vertical striæ on the inner surface of the cells, instead of series of minute spines. The cells are usually much larger than in Favosites. The genus appears to be confined to the Devonian and carboniferous formations.

MICHELINIA CONVEXA.—(D'Orbigny).

(*Prodr. de Paleont.*, t. 1, p. 107, 1850.)

Corallum forming hemispherical, or erect rudely cylindrical masses, several inches in diameter; the base covered by a strong wrinkled epitheca. Adult calices from four to five lines in diameter; about forty septal striæ in each; pores small, arranged in several vertical series in some of the tubes, irregularly distributed in others; distant from half a line to more than one line. Diaphragms very convex in the centre of the tubes, and usually with three or four smaller rounded prominences on their surface; a vertical section shews that

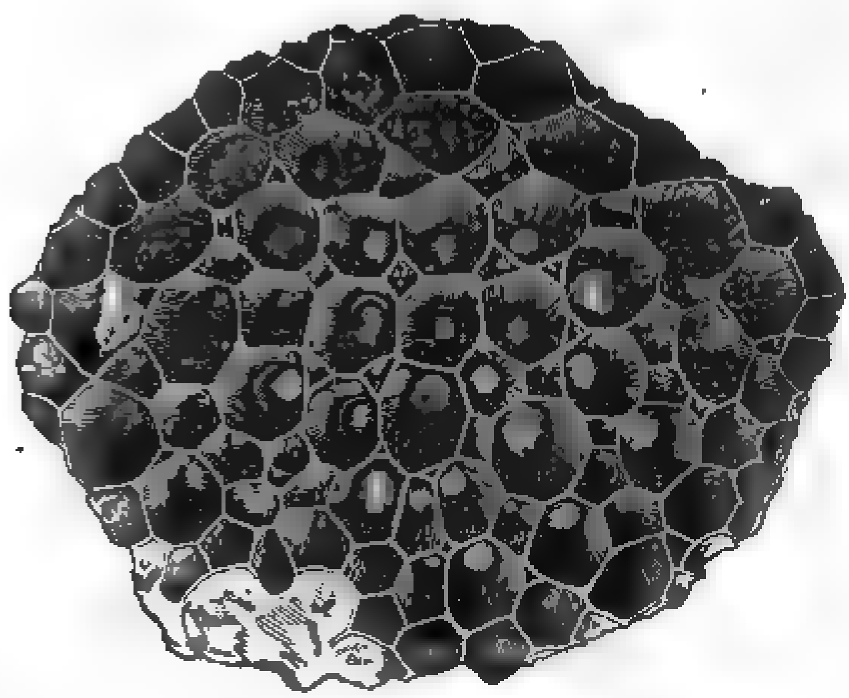


Fig. 18. *Michelinia convexa.* Specimen from Rama's farm, near Port Colborne.

they are more vesicular at the sides of the cells than in the centre, where they are from half a line to one line and a half distant.

MM. Edwards and Haime in their description of this species say that there are two vertical series of powers on the larger plane sides of the cells and one on the smaller. Our specimen, however, shew that this is not a constant character.*

Locality and Formation.—Devonian; Onondaga and Corniferous limestones. Rama's farm, Port Colborne. Savage's quarry, lot 6, con. 1, Wainfleet. Oxford, near Woodstock, and in numerous other localities in Western Canada. This species occurs in Michigan and in Preston County, Virginia.

MICHELINIA INTERMITTENS.—(Billings.)

Corallum forming large hemispherical masses; calices nearly equal in diameter, with periodical constrictions within the distance of half a line to one line and a-half. Diaphragms numerous, thin, slightly convex, sometimes shewing four or five vesicular swellings upon a single surface. The septal striæ are but slightly developed, about fifty to the inner circumference of the cell. Pores only visible in the intervals between the constrictions where the walls are thin, three or four series on each plane side of the tube. The cells are from three to four lines in diameter.

The constrictions give to the cells of this species a circular aspect, whereas they are in fact polygonal. I am not certain that this fossil is different from the species described by Edwards and Haime (op. cit. p. 299,) under the name of *Chonostegites Clappi*. If so it should I think be called *Michelinia Clappi*, as it exhibits all the characters of Michelinia. The constrictions appear to be occasioned only by the periodical thickening of the walls of the cells. Where not constricted the cells have the usual prismatic shape, with pores and septal striæ.

Locality and Formation.—The only specimen I have seen was collected by Mr. Murray, near Woodstock, C. W. It was found loose, but in lithologieal characters, it resembles the other species from the Corniferous limestone of that region.

*See Polypiers Fossiles des Terrains Palæozoiques, page 251.

Michelinia favosoidea (Billings.)

Corallum forming large hemispheric or flattened masses; cells unequal in size, adult diameter about two lines and a-half; diaphragms, flat, horizontal, with small vesicular swellings, usually around the margins of the upper surface; septal striæ very obscure, six to eight on each plane side of the cells; pores, very small, irregularly distributed, sometimes in rows of five or six across the cell, about one-sixth of a line distant from each other in some places, and sometimes absent in spaces of half a line in width. This species has much of the aspect of *Favosites favosa*, Goldfuss, but is notwithstanding very clearly a true Michelinia.

Locality and Formation.—Corniferous. Rama's farm, Port Colborne.

Genus Alveolites.—(Lamarck.)

Generic characters.—Corallum dendroid or in convex masses. Calices oblique, subtriangular or irregularly ovoid, presenting within three small longitudinal projections representing the radiating septa. A few communicating pores in the walls of the corallites. Transverse diaphragms complete.

The following species appear to belong to this genus:

Alveolites labiosa.—(Billings.)

Branching, sometimes sub-palmate, stems, about two lines in thickness; cells small, oval or sub-triangular, the lower lip, when perfect, strongly projecting; width of each cell, one fifth of a line; distance of cells from each other, half a line.

14 15 16
Figs. 14 and 15. *A. labiosa.* Fig. 16. *A. cryptodens.*

The cells exhibit several different forms, according as they are more or less worn. When perfect, they are transversely oval, and formed

on the lower side by a thin projecting lip, but when this lip is a little worn, the aperture assumes a triangular form, one of the acute angles pointing downwards. It is in this condition that the specimens are usually found. This appears also to be a reticulating species.

Locality and formation.—Rama's farm, and near Cayuga. Corniferous limestone.

ALVEOLITES CRYPTODENS.—(Billings.)

The only specimen of this species that I have seen is dendroid, the stems three lines in diameter, and the bifurcations making an angle of about seventy-five degrees. The cells open out very obliquely to the surface, and are about one line distant, measuring from the centre in a direction across the stem, but rather more than a line in the longitudinal direction. In a transverse section of the branch of the corallites, the tubes in or near the centre are not more than one-fourth of a line in width, but they are twice that size at the mouth. Two small tooth-like ridges occupy the inner surface on the side towards the exterior, apparently half a line from the mouth or lower lip of the cell. In some of the cells I think I can see a corresponding projection on the other side. The pores are also some distance within the tubes, but are distinctly visible in two of the corallites.

Locality and formation.—Rama's farm, near Port Colborne.

Genus SYRINGOPORA.—(Goldfuss.)

Generic characters.—The fossils of this genus are fasiculated or composed of large aggregations of long cylindrical corallites somewhat parallel to each other and connected by numerous smaller transverse tubes. The exterior walls consist of a well developed solid epitheca; the cells circular; radiating septa rudimentary; transverse diaphragms infundibuliform or placed one within another like a series of funnels.

About twenty species of this genus are known, and these are found in the Upper Silurian, Devonian and Carboniferous formations.

SYRINGOPORA TUBIPOROIDES.—(Yandell and Shumard.)

(*Contributions to the Geology of Kentucky*, page 8; 1847.)

(M. Edwards and L. Haime, *Polypiers fossiles des terrains palæozoiques*, p. 292.)

This species is found in large masses of long slightly flexuous corallites. These have a diameter of about one line and a-half, and

owing to their flexuosity, are at times in contact, and often two, three or four lines apart. In large colonies which have grown luxuriantly without the interference of disturbing causes, the corallites are more regular than in the smaller or stunted groups, in which the corallites are much bent and confused. The connecting processes are very short and distant, and appear to be sometimes mere inosculations of the stems. The corallites, after growing separately for a short distance, approach each other and seem to grow together or adhere to each other for the space of a line and a-half or more, they then diverge and again unite. These points of contact occur at distances varying from three lines to six, nine, or even twelve lines. Externally they exhibit numerous other indistinct annulations, and also faint indications of longitudinal striæ.

Locality and Formation.—Devonian; abundant in the Corniferous limestone of Canada West.

Fig. 17. *S. tubiporoides.*

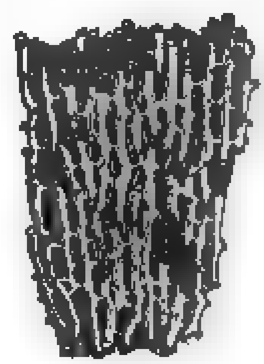


Fig. 18. *S. Hisingeri.*

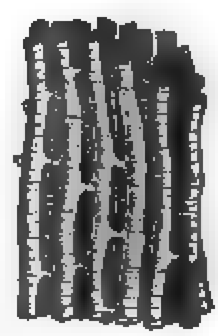


Fig. 19. *S. elegans.*

SYRINGOPORA HISINGERI.—(Billings.)

This species forms large masses of very long, nearly parallel or slightly varying, slender corallites, which are closely aggregated, and present a rugged or knobby appearance from the great number of the connecting tubes. The diameter of the corallites is one-third of a line, or a little more. The tubes of connexion are distant from two-thirds of a line to one line and a-half. The distance between the corallites is for the greater part less than their diameter. The young corallites branch from the sides of the adult individuals, and immediately become parallel with the parent, and connected with it again by the usual tubes of connexion.

Formation and Locality.—Devonian; Corniferous limestone, Canada West. (common.)

Affinities of S. Hisingeri.—Edwards and Haime have described two species from Ohio, collected in rocks of the age of the Onondaga and Corniferous limestones, which appear to be closely allied to this; the following are their descriptions:

"SYRINGOPORA VERNEUILLI.—Corallites long, distance between them twice or thrice their diameter, sub-flexuous and angular at the points of the origin of the tubes of connexion; these are distant two or three millimetres; diameter of the corallites two-thirds of a millimetre."—Devonian: Columbus, Ohio. (*Polypiers Fossiles*, p. 289.)

"SYRINGOPORA CLEVIANA.—Corallites slightly flexuous, distant once or twice their diameter, which is two-thirds of a millimetre."—Devonian: Carolton and Dayton, Ohio. (*Polypiers Fossiles*, p. 295.)

The first of these species is different from S. Hisingeri in the greater distance of the corallites. The description of the second is too incomplete to enable us to decide whether it refers to the same species or not. The authors state that their specimen was imperfect, and they were not certain it had not been previously described.

SYRINGOPORA PERELEGANS.*—(Billings.)

Description.—Corallites, one line in diameter, sometimes a little more or less, distant a little less than one line; connecting tubes half a line in diameter, and distant from one line to one line and a-half, usually projecting at right angles, but sometimes a little oblique. Epitheca with numerous annulations, generally indistinct, but under certain circumstances of growth sharply defined and deep, so much so as to give to the corallites the appearance of the jointed stalk of a crinoid. The young individuals are produced by lateral budding, and in one specimen the whole colony appears to be based upon a broad lamellar foot secretion like that which forms the base of a Favosite.

The distance of the corallites is usually about a line, but, like all the other species, this one varies a good deal in this respect. When some cause has intervened to prevent their regular growth, they are much flexed and consequently at times more distant than when they have been disturbed. The connecting tubes on the same side of the corallite are three or four lines distant, but generally on the other sides one or two others in the same space occur, making the average distance one line or one line and a-half.

* Since the publication of the Geol. Reports of last year, I have ascertained that one of Eichwold's species is called *S. elegans*, and have therefore changed the name of ours.

Locality and formation.—Devonian; Corniferous limestone, near Woodstock, Canada West.

SYRINGOPORA LAXATA.—(Billings.)

This species occurs in large colonies which appear to be founded upon a common base, but with no lateral processes between the corallites; these latter are usually two lines or a little more in diameter, the distance between them being from three to eight lines. Individuals are occasionally found single or separated from the parent group.

Locality and formation.—Near Woodstock. Corniferous.

SYRINGOPORA NOBILIS.—(Billings.)

This species is distinguished from all others of the *genus* by the great size of the corallites, which sometimes attain the diameter of five lines. In the young state the form is that of an *Aulopora*, but the adult specimens have branches three or more inches in length, with an internal arrangement of infundibuliform diaphragms, which are so blended together as to produce a structure somewhat similar to the vesicular tissue of the *genus Cystiphyllum*. The external wall is thick and rather strongly annulated.

Locality and formation.—Lot 5, Concession 13, Walpole. Corniferous.

Genus AULOPORA.—(Goldfuss).

Generic Characters.—Corallum fixed, creeping, increasing by lateral gemmation; corallites hollow, cylindrical, or trumpet-shaped, the visceral cavity of the young communicating with that of the parent; radiating septa represented by minute spines or striæ.

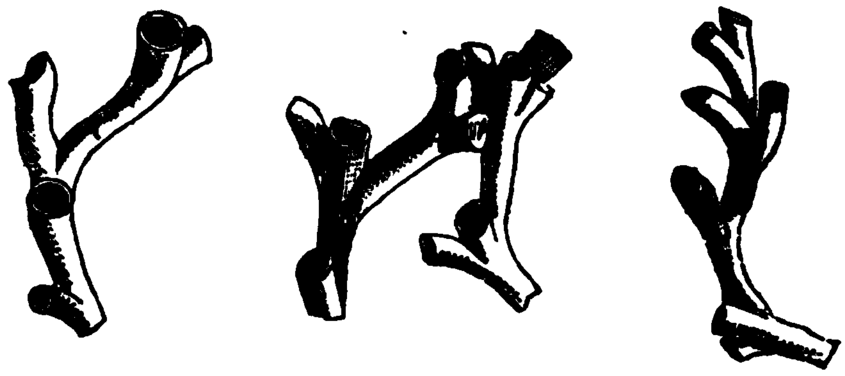


Fig. 20. *Aulopora cornuta.*

AULOPORA CORNUTA.—(Billings.)

In this species, the creeping stolons are about one line in diameter, and the mouths of the cells two lines. The young are produced at intervals of from one to six lines.

It closely resembles the figures of *A. tubæformis*, given by Goldfuss, but is always much larger.

Locality and formation.—Lot 6, con. 1, Wainfleet. Corniferous.

AULOPORA FILIFORMIS.—(Billings.)

This species occurs in somewhat confused groups, or encrusting reticulating masses, composed of tubes about one third of a line in diameter, and branching at intervals which vary in length, from less than one to three or four lines.

Locality and formation.—Occurs at Rama's farm, near Port Colborne. Corniferous. I have seen only one specimen.

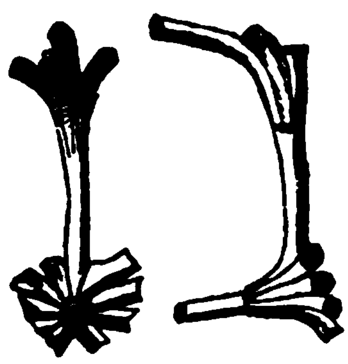


Fig. 21. *Aulopora umbellifera.*

AULOPORA UMBELLIFERA.—(Billings).

The mode of growth of this remarkable species is sufficient to distinguish it at once from all other described forms of the *genus*. The parent stems are about one line in diameter, and remain single and straight for the distance of one fourth, or half an inch, when they give off branches in all directions, sometimes ten or twelve at once. These are at first oblique or somewhat parallel with the main tube, and are connected laterally; they then radiate like the spokes of a wheel, at right angles to the parent corallites, each soon giving birth to a similar circlet of new tubes.

It may be that this species should constitute a new *genus*; but as I have not been able to ascertain wherein its internal structure differs from *Aulopora*, I have disposed of it as above provisionally.

Locality and formation.—Lot 6, con. 1, Wainfleet. Corniferous.

Genus ZAPHRENTIS.—(Rafinesque.)

Generic characters.—Corallum simple, turbinate, elongated, free, enveloped in a thin, solid epitheca; radiating septa extending nearly or quite to the centre; transverse diaphragms well developed; a

single septal fossette on one side; columella either absent or rudimentary.

The most simple, or in fact, the primitive type of corals of the order *Zoantharia Rugosa* appears to be a hollow cone, with the inner surface striated vertically by numerous thin elevated ridges, which, commencing at the bottom, ascend in a straight line to the margin of the cup. This type made its appearance during the period in which the Black River limestone was deposited. I am not aware that any species of the order have ever been found in older rocks. In a beautiful specimen of *Petraia profunda* in the collection of the Geological Survey, the conical cup is empty nearly to the bottom, and the vertical ridges or radiating septa, are seen to consist of four groups, each originating in a point at the very apex of the cone.—Three of the divisional lines between these groups are marked by a ridge or septum much stronger than the others. On the exterior of the cup there are three lines exactly corresponding in position to the three large radiating septa within. In all corals of this order belonging to the *Cyathophyllidæ* that I have seen, where there is a septal fossette, its position is indicated by the central one of the three external lines. I have examined a great many specimens of different genera and species from the rocks of this and other countries : and in every instance this rule held good. We can therefore always point out the position of the septal fosette, even when we cannot see the inside of the cup. In *Petraia* no transverse diaphragms have been observed, but there is unquestionably a septal fossette, which in the bottom is divided into two compartments by the central primary septum. In the genus *Zaphrentis* we observe another step forward in the complexity of the internal organization. The cone is not only divided into vertical or longitudinal compartments by the radiating septa, but also into horizontal chambers by the transverse diaphragms; these latter being strongly indented in one spot at their margins to form the septal fossette. Out of the various combinations of these four elements—1st, the epitheca, or thin external wall of the cone; 2nd, the radiating septa, extending from the inside of the epitheca towards the centre ; 3rd, the transverse diaphragms ; and 4th, the septal fossette—many genera have been formed, some of which no doubt must be referred back to Zaphrentis.

ZAPHRENTIS GIGANTEA.—(Lesueur.)

Two feet or more in length, sometimes three inches in diameter; surface with shallow rounded undulations of growth; from seventy to eighty radiating lamellæ, which upon the upper surface of the transverse diaphragms extend nearly to the centre, where they are somewhat flexuous; a single septal fossette near the margin; transverse diaphragms well developed, and extending between the radiating lamellæ, quite to the outer wall, upon approaching which they appear to be curved downwards.

Locality and Formation.—Corniferous limestone. Rama's farm, Cayuga; and numerous other localities in Canada West.

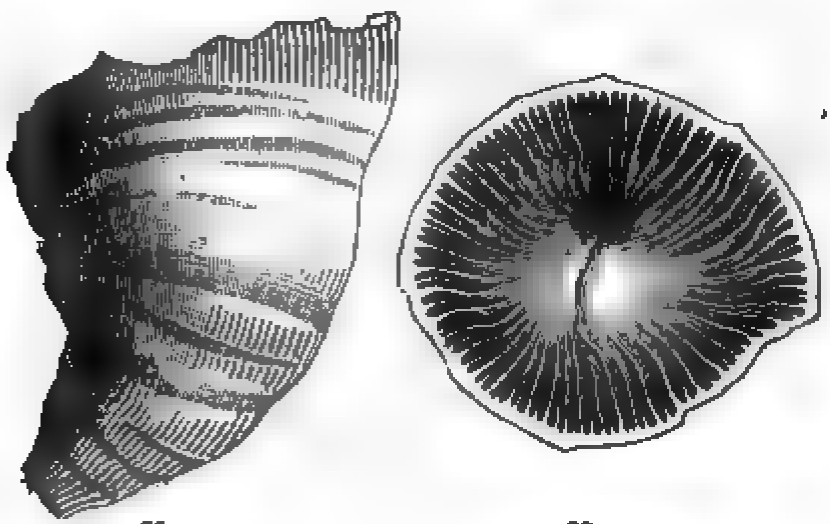


Fig. 22. *Zaphrentis prolifica*, Side view.
Fig. 23. " " Bottom of cup, shewing the septal fossette, and smooth space, with an elongated ridge-like pseudo-columella in the centre.

ZAPHRENTIS PROLIFICA.—(Billings.)

Description.—Corallum simple, turbinate, curved, with a few broad shallow encircling folds. Septal fossette of a pyriform shape, gradually enlarging from the margin towards but not quite reaching the centre, variable in its position in relation to the curvature of the fossil. Radiating septa in the adult specimens between sixty and seventy-five of the larger size, alternating with a like number of smaller ones, the former in some of the individuals extending to the centre on the bottom of the cup, where they are spirally twisted or irregularly contorted, in other specimens not reaching the centre, which is then occupied by a smooth space or often with a columella elongated in a direction from the septal fossette towards the

opposite side. The septa are also sharp-edged for about half the distance from the bottom of the cup to the margin, then become gradually less projecting until at the edge of the cup they are reduced to mere flat rounded ridges. Length from four to five inches or a little more. Width of cup from two inches to two inches and a half. Depth of cup about one inch.

Very numerous specimens of young individuals of this species, one inch and a-half and upwards in length, and with fifty or more principal radiating septa, occur along with those full grown. These small ones might perhaps be regarded as constituting distinct species, but when good specimens can be observed they all exhibit the characters which are persistent in the large individuals.

The presence of the columella seems at first sight to be a sufficient ground for placing the individuals in which it occurs in the genus *Lophophyllum* (Edwards and Haime). I have, however, examined a great number of specimens and have found every gradation between the following characteristics.

1st. Specimens with a perfectly smooth space in the bottom of the cup, no columella.

2nd. With a columella slightly developed.

3rd. Columella large and prominent, with a smooth space all round.

4th. Columella well developed, but with a number of irregular often elongated tubercles in the surrounding smooth space.

5th. The septa reaching the columella, no smooth space.

6th. Septa covering the columella.

7th. Septa reaching the centre, with the columella either prominently, slightly, or not at all indicated beneath.

This last mentioned form must certainly be regarded as a true *Zaphrentis*, all other characters of the genus being present, and from it there is a regular series of forms leading in the seven directions above indicated or more. It appears to me, therefore, that so far from these specimens being divisible into several genera they only constitute one species.

The most persistent characters are the rounded edges of the septa near the margin of the cup, and the oval shape of the septal fossette, in the bottom of which where it reaches the side of the cup is a single septum which projects a little and partially divides the fossette.

This species somewhat resembles *Z. cornicula* (Lesueur), but

differs in the edges of the septa, which are not dentated as in that species.

Locality and formation.—Devonian; Corniferous limestone. Extremely abundant at Rama's Farm near Port Colborne, Canada West.

ZAPHRENTIS SPATIOSA—(Billings).

Description.—Corallum short, turbinate, moderately curved and very broadly expanding. At the margin of the cup about ninety radiating septa alternately a little unequal and with their edges broadly rounded as in *Z. prolifica*. Length measured on the side of the greater curvature, about three inches, width of cup two inches and a half. Septal fossette unknown.

This species is closely related to *Z. prolifica*, and may perhaps be united with it when its characters become more fully known.

Locality and formation.—Devonian, Onondaga and Corniferous limestone, Rama's Farm, near Port Colborne, Canada West.

Genus AMPLEXUS.—(Sowerby.)

Generic characters.—Same as *Zaphrentis*, but with the radiating septa rudimentary, and extending but a short distance from the outer wall.

AMPLEXUS YANDELLI.—(Edwards and Haime.)

AMPLEXUS YANDELLI. Edwards and Haime. *Polypiers Fossiles*, p. 344, pl. 3, fig. 2, 2 *a*.

Corallum long, cylindrical, curved, gradually enlarging from the small pointed base to the cup, which has a variable diameter of from three fourths of an inch to one inch and a half, at a length of six inches. Surface strongly marked with from forty-five to sixty-five angular septal ridges, which are crossed by numerous small encircling striæ, and larger grooves or folds of growth. Of the smaller striæ there are four or five in one line, and they are often sufficiently strong to give the surface a sub-reticular appearance. The septa extend from about half a line to two lines from the outer wall; they are alternately large and small. The transverse diaphragms are either flat or flexuous. Edwards and Haime have figured a well developed septal fossette.

Locality and formation.—Near Woodstock, Corniferous limestone; also at the falls of the Ohio.

Genus HELIOPHYLLUM.—(Hall.)

Generic characters.—Corallum simple or aggregate; radiating septa well developed, obliquely striated on their sides by thin elevated ridges, which extend from the outer wall in an upward curved course towards the centre. These ridges are connected by numerous thin laminæ which divide the spaces between the septa into small sub-lenticular cells. The transverse diaphragms are thin, flexuous and confined to the central portion of the coral.

The only difference between this genus and *Cyathophyllum* is the absence of the curved striæ from the septa of the latter.

HELIOPHYLLUM ERIENSÉ.—(Billings.)

Very large, elongate, turbinate, straight or curved; length, from two inches to more than one foot; diameter, one inch and a half to three inches and a half; radiating septa, about one hundred and fifty in a specimen nine inches in circumference. The free edges of the septa in the cup minutely denticulated with from five to seven short spines in the length of one line; the same number of arched striæ on the sides of the septa.

None of the specimens that I have seen are perfect, and the external characters, such as the form of the surface, whether smooth or annulated, have not therefore been ascertained. The cup appears to be deep, and to have an obscure fossette on one side. A specimen one inch and a half in diameter seems to be, without much doubt, referable to this species, and as there are others three inches and a half in thickness, the size must be very variable. The small specimen has only seventy-four radiating septa, or about half the number of the large individuals.

The distinguishing character of the species is the closeness of the arched striæ on the sides of the septa, and the minute denticulation on their free edges.

Locality and formation.—Lot 19, con. 3, Walpole; and Rama's farm.

HELIOPHYLLUM CAYUGAENSE.—(Billings).

Very large, elongate, turbinate, straight, or curved, sometimes in more than one direction; cup deep, with a smooth space in the bottom, and a septal fossette on one side; free edges of septa, with the

spines nearly one line distant from each other. Radiating septa, ninety, at a diameter of two inches; one hundred and eighty, at a diameter of three inches and a half.

This species is clearly distinguished from *H. Eriensé*, by the greater distance between the arched ridges and spines on the edges of the septa. Judging from some of the fragments, the adult individuals were more than one foot in length, and three inches and a half in diameter.

HELIOPHYLLUM CANADENSE.—(Billings.)

Simple, turbinate; surface smooth or annulated, with sharp edged folds; eighty-five radiating septa at a diameter of one inch and three-fourths. In the bottom of the cup the septa reach the centre and are there twisted together so as to form a somewhat solid elevated pseudo-columella, around which there is a deep space occupied only by the septa. The spines and arched striæ are distant about two-thirds of a line from each other. Depth of cup, in a specimen two inches and a half in length, fifteen lines. The adult individuals were probably more than six inches in length.

This species differs from *H. Cayugaense* in having no smooth space in the bottom of the cup, and from *H. Eriensé* in the greater distance of the spines and arched striæ from each other.

When the specimens are perfect, the central boss in the bottom of the cup cannot be seen, as the cavity surrounding it is then occupied by the septa, which extend quite to the centre. But when the cup is much weathered, then the septa are usually absent from this cavity, and the central elevation is exposed. There appears to be a septal fossette.

This also seems to be a large species. One specimen, commencing with a small pointed base, suddenly expands to a diameter of three inches at the length of two inches and a half, and then remains cylindrical to the cup; the whole length being six inches. In this specimen there are about ninety principal septa, with an immature series which, when a little more developed, would double the number. Another specimen, eight inches in length, is much curved, and suddenly constricted in several places.

The external characters are so nearly like those of *H. Cayugaense*, that it will be found extremely difficult to distinguish the one from the other when the cup is not preserved.

Locality and formation.—Lot 19, con. 3, Walpole and Rama's farm. Corniferous.

HELIOPHYLLUM HALLI.—(Edwards and Haime).

H. HALLI.—Edwards and Haime, *Polypiers Fossiles*, p. 408, pl. 7, Fig. 6, 6 *a*, 6 *b*.

Corallum, turbinate or cylindro-conic, in general somewhat elongated and curved at the base, surrounded by an epitheca and some folds of growth. Cup circular moderately deep; a small septal fossette; radiating septa about eighty; arched ridges and septal spines half a line distant from each other. Length from one to five inches; diameter of cup in large specimen, two inches and a half.

This species is closely allied to *H. Canadense*, but differs in having the septal spines closer together, and the cup more shallow. The specimens are often abruptly bent, and annulated with deep sharp folds of growth.

Locality.—Lot 25, con. 3, Bosanquet, Hamilton group. It is said to occur in the Devonian limestone of Torquay, England.

HELIOPHYLLUM TENUISEPTATUM.—(Billings.)

Simple, turbinate, curved, strongly annulated; radiating septa thin, and very numerous in proportion to the size, there being one hundred and fifty in a specimen a little less than an inch in diameter; cup moderately deep bell-shaped; free edges of septa minutely denticulated, with about seven very short spines in one line.

The only specimen seen is one inch and one-fourth in length, and eleven lines in diameter at the margin. The cup is five lines deep.

This species differs from all the others above described, in the greater number of the septa in proportion to the size.

Locality and formation.—Lot 25, con. 3, Bosanquet, Hamilton Group.

HELIOPHYLLUM COLLIGATUM.—(Billings).

Corallum forming large masses of long slender corallites, which are connected together at intervals of from two to four lines, by periodic expansions of the cup; radiating septa about fifty-two; diameter of corallites where constricted five lines; and of the expanded cup six to ten lines. Among the full grown there are interspersed some that are immature and of a smaller size. The cup is shallow, the

sides of the septa striated with from six to eight arched ridges in one line, and their free edges denticulated with the same number of minute spines. In the central area the transverse diaphragms are well developed, and sometimes constitute a pseudo-collumella, which exhibits itself in the shape of a small elevated boss in the centre of the cup.

This species is found in large densely aggregated masses, which have much the external aspect of certain species of the genus *Acervularia*, but with an internal structure identical with that of *Heliophyllum*. It constituted a passage between the latter and *Phillipsastrea*, the only difference between the two being that in the one the corallites are either simple or partially connected laterally, while in the other they are so intimately united that the septa of the contiguous cells are confluent.

Locality.—Rams's Farm, near Port Colborne.

Genus PHILLIPSASTREA.—(Edwards and Haime).

Generic Characters.—This genus, as above stated, does not differ from Heliophyllum, except in having the corallites united laterally throughout their whole length so that the septa of the contiguous cells are confluent.

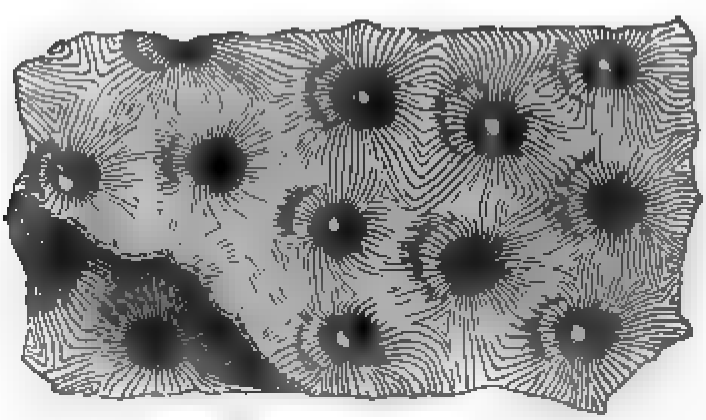


Fig. 24. *Phillipsastrea Verneuili.*

PHILLIPSASTREA VERNEUILI.—(Edwards and Haime).

PHILLIPSASTREA VERNEUILLI.—Edwards and Haime, Polypiers Fossiles, p. 446, pl. 10, fig. 5, 1851.

This species forms large flat masses, with the surface covered with stars about half an inch in diameter. The cup is usually three lines wide, with a rounded margin from which the surface slopes in all

directions to the contiguous corallites. There are between thirty-five and forty-five radiating septa minutely denticulated or striated on their edges, with from six to ten ridges or spines in one line. When the cup is empty the inner surface is nearly perpendicular, and vertically striated by the free edges of the radiating septa. It is often filled by the rough projecting termination of the pseudo-columella.

Localities.—Lot 2, con. 4, Rainham. Corniferous. It occurs also in the same formation in the State of Wisconsin.

PHILLIPSASTREA GIGAS.—(Dale Owen, sp.

ASTREA GIGAS.—D. D. Owen, geological survey of Iowa, &c., 1844. p. 70, pl. 14, Fig. 7.

This species is in all respects the same as *P. Verneuili,* except that the corallites are much larger and the arched ridges on the sides of the septa more distant. The average diameter of the stars is one inch in most specimens, but I have seen some that were nearly two inches wide. It is not improbable that materials may yet be procured to connect the two species.

Locality.—Lots 5 and 6, in the 14th Concession of Walpole.

Genus CLISIOPHYLLUM.—(Dana.)

Generic characters.—The corals of this genus have the same general external form as those of the genus *Zaphrentis,* and their internal structure is also the same, except that the transverse diaphragms are elevated in the centre so as to form a small conical protuberance in the bottom of the cup, and further, they are enveloped in an outer area composed of vesicular tissue. The septal fossette is small, and in worn specimens its place is often indicated by the prominence of one of the septa on the outside, which, being stronger than the others, forms a longitudinal angular ridge. The cells of the tissue which fills the outer area, slope upwards and outwards.

CLISIOPHYLLUM ONEIDAENSIS.—(Billings.)

This species is from six inches to one foot or more in length, and from one inch and a half to two inches and a half in diameter, often curved more or less abruptly and in more than one direction. The surface is strongly annulated, the ridges being in general sharp-

edged and sometimes imbricating or folding over in an upward direction. The septal striæ on the exterior are very numerous, there being six in the width of two lines, where the diameter is an inch and a-half, and five in the same width, where the diameter is two inches. The cup, in a specimen one inch and a-half in diameter, is three-fourths of an inch in depth, and exhibits the free edges of eighty-two radiating septa; the cone is one-fourth of an inch in height, but appears to have been higher. Another specimen, two inches in diameter, has eighty-four septa; and a third, two inches and a-half in thickness, exhibits ninety-seven: the septa, therefore, appear to vary in number between eighty and one hundred. There is a septal fossette, the place of which is usually indicated in worn specimens by an obscure angular longitudinal ridge. The longitudinal septal striæ on the surface are double the number of the principal septa. The external area is only about one or two lines in thickness, and composed of cells which in worn specimens have a rectangular opening on the surface, and are either of the width of the spaces between the principal septa, or only half that size when they are subdivided by the thin rudimentary septa.

Small specimens of all sizes, up to five inches in length, which appear to be the young, are common; the very large ones, of one foot or more, being not so plentiful. The species is closely allied to *C. coniseptum*, which occurs in the mountain limestone in England, but is more strongly annulated and the septa more numerous. Some of the specimens are nearly straight, but in general they are much twisted in different directions and occasionally subject to rather abrupt diminutions in the diameter.

Locality.—Rama's Farm, and in many places in the County of Haldimand; Corniferous limestone.

Genus BLOTHROPHYLLUM.—(Billings.)

Generic characters.—Corallum, simple, turbinate or cylindrical. Internal structure, consisting of a central area occupied by flat, transverse diaphragms, an intermediate area with strong radiating septa, and an outer area in which there is a set of imperfect diaphragms projecting upwards, and bearing on their upper surfaces rudimentary radiating septa. A thin complete epitheca and a septal fossette. Generic name from Greek Βλωθρός.

This genus differs from *Clisiophyllum* in having the diaphragms flat.

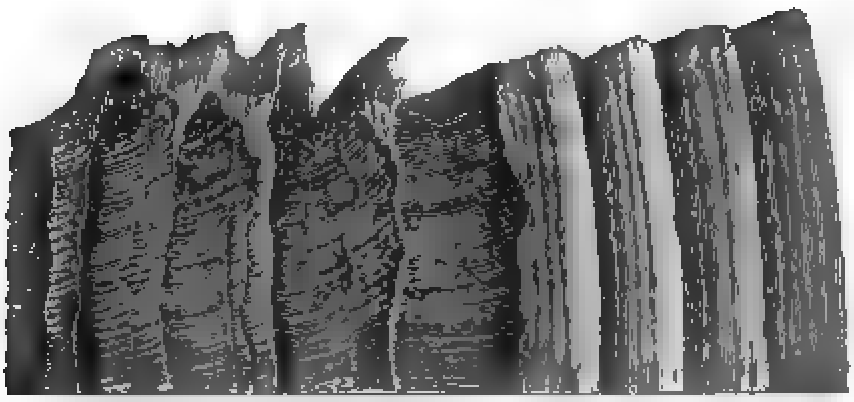


Fig. 25.—*Blothrophyllum decorticatum.*
(One-half of a side view of a fragment. The left hand end of the figure shews the condition in which the specimens usually occur.)

BLOTHROPHYLLUM DECORTICATUM.—(Billings.)

Adult specimens two feet in length and three inches in diameter dimensions of the immature individuals variable, usually slender and irregularly curved, outer area consisting of rather strong rudimentary transverse diaphragms, curving upwards and outwards, distant from two to eight lines, bearing upon their upper surfaces imperfect radiating septa, which do not extend from one diaphragm to another. These septa are half a line distant at the margin of a specimen three inches in diameter. When the epitheca is preserved, the surface of this species is marked by numerous deep annulations and sharp encircling folds, their edges being always on the upper side. The transverse diaphragms in the central area are nearly flat, but have a strong septal fossette upon one side.

In the Corniferous limestone of Canada West, very numerous silicified specimens of this species occur with the outer wall totally removed, leaving nothing but the core of the central area with the partly destroyed curved rudimentary diaphragms attached, presenting an appearance of exfoliation exhibited by no other species in that formation.

Locality and Formation.—Abundant in the Corniferous limestone at nearly all the localities in the County of Haldimand.

Genus ERIDOPHYLLUM (Edwards and Haime.)

ERIDOPHYLLUM.—(Milne Edwards and J. Haime.) *British Fossil Corals.* Introduction, p. 71, and in *Polypiers Fossils,* p. 423.

The genus *Eridophyllum* of Edwards and Haime differs from *Diphyphyllum* only in having the stems connected by lateral processes.

somewhat similar to those of the genus *Syringopora*. These processes may be observed in every stage of development upon the sides of the corallites. Some are just elevated above the surface, while others project more or less, but terminate in sharp points before reaching the neighbouring stem. Those which are sufficiently extended to come in contact with a contiguous corallite have their extremities sometimes forked, the branches clasping round the trunk, but often they are perfectly united or incorporated with the epitheca directly, and without bifurcation. It is a remarkable character that in most of the specimens they are nearly all turned in the same direction or towards the same side of the whole group. It may be that this peculiar mode of growth was induced by the currents of the ocean, the processes growing either against or with the stream. Occasionally we find a specimen in which they radiate in all directions, and it is probable that these may have grown in places where there was still water. When the stems are very flexuous, they sometimes touch each other, and in such instances they grow together for a short distance, and then separate.

The fossils on which the genus was founded were collected by De Verneuil at the falls of the Ohio, in strata which are no doubt of the same age as the Corniferous limestone of Canada and New York.—Two of the Canadian species are identical with two of those described by Edwards and Haime; and I should not be surprised if the third should yet turn out to be *E. rugosum* of the same authors.

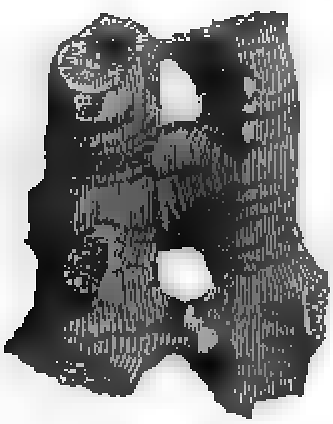


Fig. 26. *Eridophyllum Verneuilanum.*

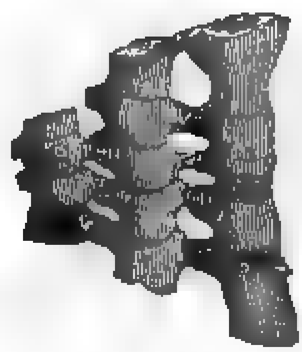


Fig. 27. *Eridophyllum Simcoense.*

ERIDOPHYLLUM VERNEUILANUM.—(Edwards and Haime.)

ERIDOPHYLLUM VERNEUILANUM. Edw. & Haime, *Polypiers Fossils*, p. 424, pl. 8, fig. 6, 6 *a*.

Corallites half an inch or a little less in diameter, aggregated in large masses, sometimes two or three feet in width; surface strongly

marked with the longitudinal septal striæ; connecting processes from half an inch to one inch and a half distant from each other; radiating septa about forty-five, and when perfect, extending nearly to the centre; central area varying from one to three lines in width; transverse diaphragms, thin, flat, two to five in one line. The corallites are usually half an inch or a little more separate, but often they are nearly in contact, and even grow together for a distance of one inch or more.

According to Edwards and Haime there are, in the specimen figured by them, only twenty-two radiating septa. It must be borne in mind, however, that in corals of this order very frequently many of the septa are totally destroyed during the process of fossilization. It will be seen by referring to their figure 6 *a*, that twenty-three well-developed septa are represented, and that in seven of the interseptal loculi, remains of the intermediate lamellæ are clearly indicated, and the total number must therefore have been originally forty-six. Our specimens agree so nearly with their figures that there can be little doubt of their identity. Some of the corallites exhibit more than forty-five septa, and in fact, in most of the *Zoantharia rugosa*, the number is variable within certain limits.

Locality and Formation.—Rama's farm, near Port Colborne; lot 19, con. 3, Walpole; and near Woodstock.

ERIDOPHYLLUM SIMCOENSE.—(Billings.)

In this species, the corallites are two or three lines in diameter, and usually straight, in which case they are parallel; distant from one to three lines, and connected by short, conical, sharp pointed processes, at intervals of once or twice the thickness of the stems.—The surface is annulated, with more or less strongly developed rings, which are generally oblique, and sometimes consist of sharp-edged folds of the epitheca. There are between forty and fifty radiating septa; transverse diaphragms well developed.

Some of the colonies have the corallites very crooked, and connected at greatly varying distances. Such masses can only be regarded as groups in which the growth was disturbed, not as distinct species.

Locality and Formation.—Rama's farm; and near the town of Simcoe.

ERIDOPHYLLUM STRICTUM.—(Edwards and Haime).

ERIDOPHYLLUM STRICTUM.—(Edwards and Haime,) *Polypiers Fossiles*, p. 424, pl. 8, fig. 7.

Corallites elongated, cylindro-turbinate, connected by processes, moderately developed, and at variable distances. Gemmation calicinal; three or four young springing at the same time from the same cup. Diameter of the large corallites four to five lines.

Of this species we have only a fragment, which appears not to differ from the figure given by the French authors. The gemmation appears to be lateral as well as calycinal, and the corallites are strongly annulated.

Locality and Formation.—Near Woodstock. Corniferous.

Genus DIPHYPHYLLUM.—(Lonsdale.)

DIPHYPHYLLUM.—(Lonsdale.) In *The Geology of Russia*, p.622. 1845.
" —(McCoy.) *British Palæozoic Fossils*, p. 87. 1851.
DIPLOPHYLLUM.—(Hall.) *Palæontology of New York*, Vol. 2., p. 115. 1852.

Generic Characters.—Corallum simple, or often forming large masses of long slender cylindrical stems, more or less distant from each other, and sometimes in contact; internal structure biareal; no central axis; the large central area occupied by transverse diaphragms; outer vesicular area variable in its dimensions, in some species very slightly developed; radiating septa numerous, rarely extending to the centre.

Although there has been some difference of opinion among palæontologists as to the correct definition of this genus, yet all appear to understand clearly what group of fossils Lonsdale had in view when he published his description, and therefore his name must be retained, even if he were in error when he supposed that the addition of the young corallites was affected by the fission of the parent polyp. Edwards and Haime believed that the genus was founded upon specimens of a species of Lithostrotion, in which the columella had not been preserved, while at the same time they thus explain the appearance of dichotomous division so often exhibited by the corallites. The following are their remarks upon *D. concinnum*: "All the fossils of this species that we have examined were in a bad state of preservation, and the genus *Diphyphyllum* established for them by Mr. Lonsdale, does not appear to us sufficiently characterised, for it differs from

Lithostrotion only by the absence of the columella, and we have much reason to think that the non-existence of that organ is here merely accidental, and due to the process of fossilisation. The considerations which induced Mr. Lonsdale to form this new generic division, were founded upon the supposed fissiparous mode of multiplication of these corals; but after close examination of their structure, we are fully convinced that they are not in reality fissiparous, and that the appearance which at first sight may be taken for a fissiparous division of the calice, is due to the rapid lateral coalescence of the young individual produced by gemmiparity and the parental corallite."*

The first of the two reasons given in this quotation for uniting *Diphyphyllum* with *Lithostrotion* is sufficiently answered by the fact that there are several species agreeing precisely with Lonsdale's figures and descriptions in every other respect, which in numerous well preserved specimens exhibit no trace of a columella or central axis. The second is well explained by the observations of Edwards and Haime, who are of opinion that what appears to be a fissiparous gemmation is in fact a species of calicinal budding. Upon this point our specimens throw much additional light. In the same group some of the corallites have young ones budding from their sides, while others bifurcate, the two branches being equal in size to each other and to the parent stem. The statement, therefore, of Lonsdale, that the species examined by him appeared to be renewed by fission, is not sufficient to warrant the suppression of the genus, it being in substance only an erroneous view of one of the characters.

The name of *Diplophyllum* was proposed by Professor Hall, in 1852, for some corals of the Niagara limestone, which have all the characters of *Diphyphyllum*. Figures 1 *m* and 1 *n* Plat. 33, Pale. N. Y., vol. 2, may be referred to as good representations of lateral budding and fiissiparous gemmation exhibited in the same corallites.

Diphyphyllum arundinaceum.—(Billings.)

Description.—Corallum forming large masses of long, cylindrical, straight or flexuous stems, from three to four lines in diameter, sometimes in contact but usually distant from one to three lines from each other; radiating septa thin, between forty and fifty in number, rarely

*Edwards and Haime. *British Fossil Corals*, published by the Palæontographical Society, p. 145.

reaching the centre; transverse diaphragms turning downwards on approaching the margin; two to four in one line. In some of the corallites the walls are so thin and closely united that no separation can be observed, but in others of the same cluster an outer area is distinctly visible. There is usually a circular space in the centre of the corallites, half a line or a little more wide, into which the radiating septa do not penetrate, often, however, they reach the centre. The young corallites sometimes spring from the side of the parent with a slender base, and curving upwards immediately become parallel with those of the whole group. In large colonies frequent instances may be seen where instead of this lateral budding a bifurcation takes place, both branches being of the same size. In large groups, owing to the numerous additions of young, the corallites diverge slightly, as if radiating from a point. The colonies are from six inches to several feet in diameter, and large blocks of stone are of frequent occurrence, which are penetrated at right angles to the stratification by the closely crowded stems.

Locality and Formation.—Rama's farm, near Port Colborne, and in various localities in the townships of Walpole, Oneida, Cayuga, and Wainfleet, in the Corniferous limestone.

Collectors.—A. Murray, E. Billings, T. De Cew.

Several specimens in the Cabinet of the Canadian Institute at Toronto.

DIPHYPHYLLUM STRAMINEUM.—(Billings.)

Description.—Corallum forming large masses of cylindrical tubes averaging two lines in diameter, and either so closely aggregated as to be nearly in contact, or separated from each other by intervals of from one to five lines, the distance varying in different clusters and in different parts of the same. Sometimes numerous single tubes occur scattered through the rock, which were probably derived from some disintegrated group. The tubes are either straight or flexuous, smooth, or annulated by short encircling folds of growth, the surface striated longitudinally by the outer edges of the septa. These latter are about forty in number, and do not reach the centre. The transverse diaphragms are well developed, slightly convex in the centre, and appear to be suddenly turned down on approaching the margin. The outer vesicular area is thin, seldom exceeding one-sixth of the whole diameter. The central area altogether occupied

by the transverse diaphragms; sometimes in well preserved specimens the septa may be seen extending about half way to the centre upon the surface of some of the diaphragms, but in general they are confined to the outer area. In the more dense colonies the corallites often inosculate, and are sometimes connected by lateral processes, as in species of the sub-genus *Eriodophyllum*.

This species is almost identical with *D. Gracile*, McCoy (op. cit. p. 88,) but differs in the following respect: *D. Gracile* has about forty septa, one half of which are very minute or greatly less than the others, but in *D. stramineum* the septa, about forty in number, are all nearly equal.

Locality and Formation.—Common in the Corniferous limestone, lot 6, con. 1, Wainfleet. There is a specimen in the Cabinet of the Canadian Institute at Toronto from near Simcoe.

Genus CYSTIPHYLLUM.—(Lonsdale).

Generic Characters.—Corallum simple or aggregate, entirely filled with vesicular tissue; radiating septa, rudimentary or obsolete.

CYSTIPHYLLUM SULCATUM.—(Billings).

Description.—Short, turbinate, much curved, expanding at the rate of between forty and forty-five degrees from the minute sharp curved point upwards; cup oblique, the lower margin being on the side of the lesser curvature, moderately deep, and nearly regularly concave, the bottom covered with obscure coarse rounded radiating ridges; a shallow rounded groove or fossette extending from the centre to the higher margin, and in some specimens two others much less distinct, radiating to the sides at right angles to the main groove. Exterior encircled by obscure undulations, and longitudinally striated by the rudimentary radiating septa. The vesicular structure consists of irregular sub-lenticular cells, from half a line to two lines in width; length of the convex side, from one inch and a half to three inches, the usual length appears to be about two inches or a little more; width of cup from one inch to one inch and a half; depth about half an inch.

This species, when the interior cannot be seen, might be mistaken, upon a superficial examination, for a small curved *Cyathophyllum* or *Zaphrentis*. It is about the size and shape of the curved specimens of *Petraia cornicula*.

Locality and Formation.—Rather common in the Corniferous or Onondaga limestone on Rama's farm, Port Colborne.

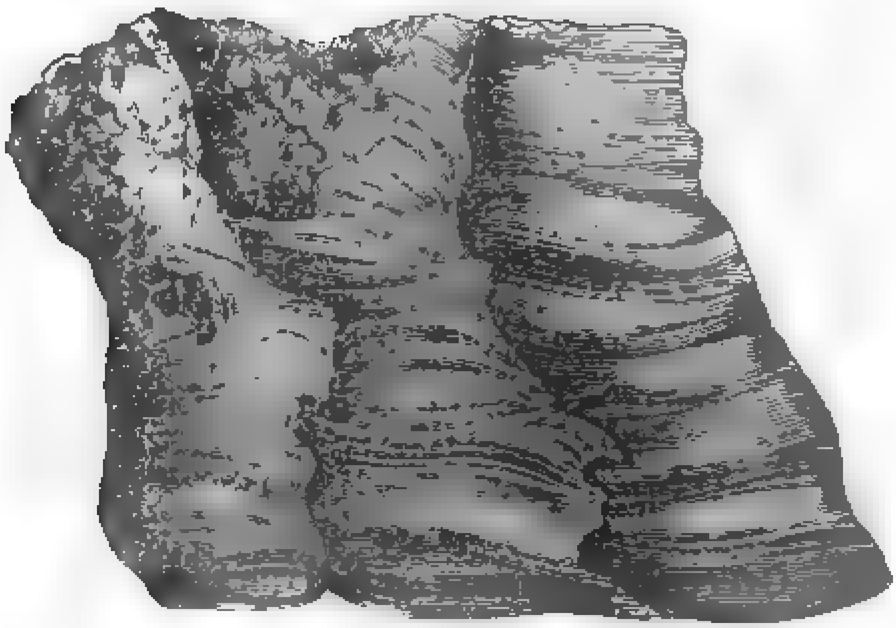


Fig. 28.—*Cystiphyllum aggregatum.*
(View of part of the specimen in the cabinet of the Canadian Institute.)

CYSTIPHYLLUM AGGREGATUM.—(Billings.)

The only specimen of this very distinct species that has come under my observation is in the cabinet of the Canadian Institute. It consists of a mass of cylindrical corallites closely aggregated and in places united by projecting folds of the outer wall, as in the genus *Eridophyllum.* The individuals are completely enveloped in a thin epitheca which is obliquely wrinkled and filled with small sub-lenticular cells, one or two lines in width. Diameter of longest corallite in the group, one inch, and of the smallest, five-eighths of an inch.

I believe that this is the first aggregated *Cystiphyllum* yet discovered, and one of its characters, that is to say the manner in which the corallites are connected, seems to shew that the distinction between *Eridophyllum* and *Diphyphyllum* is not of generic importance. The difference between the genera consists in the presence or absence of the processes that unite the individuals of the colony, and as this is of specific value and no more in *Cystiphyllum*, it may be so in the others.

Locality and formation.—Near Simcoe.

CYSTIPHYLLUM SENECAENSE.—(Billings.)

This species is elongate, slender, straight, or variously-curved. Cup deep and sometimes vertically striated on the inside, with from sixty

to one hundred obscure sulci indicating the rudimentary radiating septa. Surface with a very thin epitheca, which is seldom preserved. Interior completely filled with vesicular cells, those near the centre being the largest. These cells are sometimes arranged in funnel-shaped layers, and thus many of the specimens appear to be composed of a series of hollow cones fitting into each other. Length, from three inches to two feet; diameter, three-fourths of an inch to one inch and a half.

The long, slender specimens are often very much and irregularly curved.

Locality and formation.—Abundant in the corniferous limestone in the Townships of Seneca, Cayuga, Oneida, Walpole, Wainfleet, and Humberstone.

Cystiphyllum grandis ?—(Billings).

This species is very large, turbinate, more or less curved, and enveloped in a thin wrinkled epitheca. Cup deep bell-shaped, either striated with the rudimentary radiating septa, or consisting of an uniform surface of the small depressed convex cellular elevations. The growth appears to have been intermittent, or by the formation of successive layers of cells upon the inner surface of the cup, and consequently in longitudinal sections the substance of the whole mass is seen to be arranged in a series of funnel shaped strata, placed one within another. The separation between the layers is much more distinct in some specimens than in others.

There are fragments of this species in the collection of the Geological Survey of Canada, five inches in diameter; and one specimen, still lying in the rock, is known which is three feet long.

This species has been referred to *C. vesiculosum*, (Goldfuss,) but is a much larger form. I do not feel satisfied that it is distinct from *C. Senecaense*. In structure it closely resembles that species; but, on the other hand, the young specimens suddenly expand to a diameter of from two to three inches or more, at a length of three or four inches, while the young of the former, of the same length, are not more than one fourth that thickness. It may be that materials can be procured to connect all the forms into one very variable species.

Locality and Formation.—Lot No. 6, con. 1, Wainfleet.

CYSTIPHYLLUM AMERICANUM.—(Edwards and Haime).

C. AMERICANUM.—(Edwards and Haime,) *Polypiers Fossiles*, p. 464.

C. CYLINDRICUM.—(Hall,) *Geology of New York*, part 4, p. 209, No. 48, fig. 1, 2.

Elongated, straight, or curved, enveloped in a thin epitheca; surface usually with numerous sharp and prominent folds, sometimes smooth. Cup moderately deep, and in the large specimens rounded in the bottom, feebly marked on the sides with the septal furrows; internal structure uniformly vesicular, the cells near the outside being from half a line to one line and a half wide, and somewhat larger in the centre. Length from one to six inches; diameter from three-fourths of an inch to three inches.

This species is exceedingly variable in form. The specimens are straight, gently or abruptly curved.

Genus HAIMEOPHYLLUM.—(Billings.)

Corallum aggregate, consisting of colonies of long slender sub-parallel corallites, united laterally by periodical expansions of the cup. Internal structure of vesicular diaphragms, as in the genus *Michelinia;* radiating septa rudimentary.

This genus differs from *Michelinia* in having no pores in the outer walls; and from *Cystiphyllum* in having the interior filled with cells, which are most prominent in the centre of the tubes, and curve downwards as they reach the margin.

It is dedicated to the late Jules Haime, one of the authors of that excellent work, *Polypiers Fossiles des Terrains Palæoziques.*

HAIMEOPHYLLUM ORDINATUM.—(Billings.)

Corallum forming large sub-globular or flat hemispheric masses; average diameter of the corallites in the constricted portions one line and a half to two lines, and of the expansions two and a half to three and a half lines. The epitheca, where it can be seen between the expansions, is more or less distinctly marked with the longitudinal septal striæ. There appears to be about forty internal striæ. The expansions which connect the corallites are periodical, or occur at the same level in all the individuals at distances of from one to three lines.

There are some specimens in which the expansions occur at intervals of less than one line, and they are even so close together that

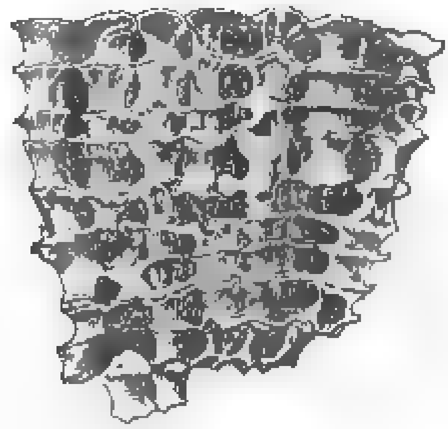


Fig. 29. *Haimeophyllum ordinatum.*

the coral appears at first sight to be a large sub-globular mass of concentric laminæ. I do not at present think these can be separated as a distinct species from those with expansions one or two lines distant.

Locality and Formation.—Township of Walpole. Corniferous limestone.

NOTE ON THE OCCURRENCE OF ASAPHUS MEGISTOS IN CANADIAN ROCKS, WITH ADDITIONAL REMARKS ON ASAPHUS HINCKSII.

BY E. J. CHAPMAN,
PROFESSOR OF MINERALOGY AND GEOLOGY, UNIVERSITY COLLEGE, TORONTO.

In the last No. of the *Canadian Journal* we published a brief description of a new species of Asaphus, *A. Hincksii*—the fourth species of that genus recognised in the Lower Silurian rocks of Canada. Mr. Billings, of the Geological Survey, has subsequently had the kindness to place in our hands, for examination, a specimen of a trilobite discovered some time ago in the Trenton Limestone of Cobourg, C.W., by Mr. J. F. Smith of Toronto. This species, as suggested by Mr. Billings, proves to be identical with the *A. megistos* (of Prof. Locke) from the Trenton Limestone of Ohio. Still more recently, Sir William Logan has kindly lent us a second example of the same species, discovered at Cobourg, and presented to him by — Blackwell, Esq. These examples differ from the figure given by Prof. Locke

(Transactions of the Association of American Geologists and Naturalists: Boston, 1843), chiefly in the more acute outline of the head-shield, and in the development of the glabella. The latter character, however, in the genus Asaphus, is so indefinite and irregular as to be of little importance; and the agreement between the two forms, in all essential characters, is too close to admit of their separation. On comparing these examples with various fragmentary specimens in our possession, we have reason to believe that *A. megistos* occurs in the Trenton Limestone of other parts of Canada, as well as in that of Cobourg. As we propose shortly to publish a figure and revised description of this species in a detailed Monograph on the genus Asaphus as occurring in Canada, we will merely state, at present, that *A. megistos* is distinguished from other species, by the possession of a smooth pygidium, coupled with the presence of short narrow horns at the posterior angles of its head-shield. Apart from the horns, it much resembles in its general aspect the well known *Asaphus platycephalus.* The branches of the facial suture, as in the latter form and other species of the same type, meet in a well defined point close to the anterior margin of the head-shield.

In the specimen discovered by Mr. Blackwell, we find some of the pleuræ broken away, and the stone retaining a sharp impression of the under side of these. In this impression there occurs on each pleura, near the end and close to the upper margin (exactly as in *A. Hincksii: Canadian Journal,* vol. iv., page 3), a single deep and oblique pit, somewhat triangular in form, and with the deeper part towards the posterior extremity of the body. These peculiar cavities are situated just where the under part of the shell or its incurved portion terminates. This we have verified by actual observation. One would naturally expect to find a projecting point or tubercle at the spots in question, but we have failed to detect anything of the kind. On the contrary, there appears to be a hollow space or cavity at these places, filled with the substance of the enclosing rock. Hence the pits or indentations must have been made by (or moulded upon) some soft or perishable organ; and this seems the more probable, as the pleuræ have anteriorly a broad and flattened surface, admitting—as shown by one of the specimens which is partially rolled up—of very complete imbrication, and yet no trace of a cavity or corresponding mark of any kind is to be seen on these surfaces. At the same time, it must be observed that similar cavities occur in the impression of the head-shield, one on each side, near the posterior angles; and in the specimen

discovered by Mr. Blackwell, a small spine of a somewhat lighter color than the other portions of the shell, is seen to pass into these. The faculty of imbrication seems, however, to be incompatible with the existence of hard spines on the under sides of the pleuræ; more especially as no trace of a short longitudinal groove or other depression occurs on their upper surfaces, against which, during imbrication, the spines must have been pressed. As the peculiar pit-marks here described, do not appear to have been previously noticed on any example of a trilobite, we are induced to call attention to them in the hope that further light may be thrown upon their occurrence by the observations of other palæontologists.

We have arranged in the following table the five Canadian species of Asaphus discovered up to this time. Only two forms, it will be observed, occupy the same division; and, in these, the opposite characters of the pleuræ are alone sufficient to establish a distinction of species.

	Pygidium smooth:	Pygidium furrowed:
Head-angles more or less rounded.	*A. platycephalus*, Stokes. *A. Hincksii*, Chapman.	*A. Halli*, Chapman.
Head-angles terminating in horns.	*A. megistos*, Locke.	*A. Canadensis*, Chapman.

The horned species of the genus Asaphus fall naturally into two groups: in one of which, the horns are broad and flat; and, in the other, thin and cylindrical. The recognised Canadian examples belong to the latter type—a type apparently unknown amongst the European species. Hall's *Asaphus Barrandi*, on the other hand, is an American example of the first type.

REVIEWS.

CRANIA BRITANNICA; *Delineations and descriptions of the skulls of the early inhabitants of the British Islands, together with notices of their other remains.* By JOSEPH BARNARD DAVIS, M. R. C. S. E., and JOHN THURNAM, M. D. Decade III. London: Taylor & Francis, 1858.

Another fasiculus of this important contribution to the physical ethnology of the British Islands, has come to hand; and amply sus-

tains the character established by the previous decades. Any critical analysis even of the separate sections of the work, however, must be reserved till its completion; as, owing to the simultaneous issue of the chapters or sections devoted to the several divisions of the subject, no part of it is yet presented in such a form as fully to develope the authors' views. This is the more apparent from the fact that they have to collect their data as the work proceeds; and, in the fasiculus just issued, "assistance in the way of additional specimens is still particularly desired—a number of both ancient and modern skulls being of the utmost importance for study and selection." The authors are, in truth, confessedly even now accumulating the requisite materials, and the trustworthy evidence, on which any final opinion is to be based, either by themselves or others; and they not only withhold their verdict, but delay even the process of induction, until all the proofs are before them. It might, indeed, be a matter of no little interest could we ascertain all the varied phases of opinion through which their minds have passed, since a work was begun which, to them, as well as to their readers, gradually discloses such selected evidence in relation to the physical ethnology of the British Isles. Writing in 1856, Mr. Davis remarks, in the address to the subscribers appended to the first Decade: "To give worth to any deductions which may arise from a general survey of the series of Crania submitted to examination, or to any dissertational matter connected with the inquiry, or growing out of it, a necessity exists for first allowing the greater part of the evidence to be unfolded before both writer and reader. Probably such deductive matter may never be very elaborate, although as precise and complete as the light to be derived from the tomb admits; still its proper place will be at the approaching termination of the work, to accompany the fifth and sixth Decades." This was written in March, 1856, at which date it was further stated that: "Such arrangements have been made, as, it is expected, will lead to the issue of a Decade every six months till the work is finished." Had such proved to be the case, we should now have the sixth instead of the third Decade; but the delays in such a work are equally unforeseen and inevitable, and it can scarcely admit of question that the materials accumulated during the period thus extended will amply atone for the slow progress of the work towards completion. To the subscribers this will be an unalloyed gain, but to one of the authors, Joseph Barnard

Davis, on whom we believe the entire risk and cost of the work devolves, it will be a source of considerable additional expenditure, as he finds himself necessitated, in his enthusiastic development of the subject, to be more copious in the text, and more profuse in the illustrations, than was at first contemplated, or than economic considerations will very well justify.

Meanwhile we extract, from the present Decade, some incidental remarks on the artificial modifications of cranial development, both in American, and in the primitive British races, suggested—in part at least,—by a paper previously published in this Journal.

"Among the American races in general," says Mr. Davis, "there is so marked a flatness in the occipital region, that Professor Morton was induced to regard it as one of the few typical characters of the skull belonging to the American nations, and spreading from one end of the continent to the other. This position, which is no doubt founded in truth, must be allowed to be liable to numerous exceptions. Yet the crania of Americans figured by Sandifort (*Cranium Americani Septentrionalis,*) and by Milne Edwards, the latter given as a typical skull (*Cuvier's Règne Animal, Race Americaine,*) are both distinguished by a considerable occipital projection. Professor Daniel Wilson of Toronto, in an able paper (*Canadian Journal*, vol. ii., p. 406), has expressed a reasonable doubt whether this occipital flatness, or great vertical diameter, be properly a universal character of the American races, and has supported his argument by observations made upon crania disinterred in Canada, and considered to have belonged to the Iriquois and Hurons. He has also given expression to a query, which the examination of skulls remarkable for vertical diameter and flatness of occiput naturally induces, whether the American races may not owe these cranial characters, in some measure at least, to artificial distortion. That nature has accorded to many of them a brachycephalic skull, and also that this feature is so marked as to be regarded as a typical character among the western races may be admitted. Still art has been frequently, almost generally, called in to heighten this conformation, in a smaller or greater degree. And it is by no means improbable that its influence may be perceived among the aboriginal crania of the British Isles, especially in this greater or less occipital flatness, which is frequently unsymmetrical."

In Mr. Davis's latter remark on aboriginal British crania, he adopts

suggestive observations on the same subject, which occur in the article in this Journal, above referred to. The remarks are thus introduced, in commenting on a passage in Dr. Morton's "*Crania Americana*," on forms peculiar to American skulls: "Dr. Morton adds, in describing an unsymmetrical skull, 'I had almost omitted the remark that this irregularity of form is common in, and *peculiar to, American crania.*' The latter remark, however, is far too wide a generalization. I have repeatedly noted the like unsymmetrical characteristics in the Brachycephalic crania of the Scottish Barrows, and it has occurred to my mind, on more than one occasion, whether such may not furnish an indication of some partial compression, dependent, it may be, on the mode of nurture in infancy, having tended, in their case also, if not to produce, to exaggerate the short longitudinal diameter, which constitutes one of their most remarkable characteristics."—*Canadian Journal*, vol ii. p. 426.

It cannot be viewed otherwise than with interest, by the readers of the *Canadian Journal*, thus to find observations made on crania dug up from the Indian graves of our Canadian clearings, reflecting light on characteristics of the aboriginal Briton, it may be, of many centuries prior to the Christian era. D. W.

How Plants Grow: A simple Introduction to Structural Botany, with a popular Flora; or, An Arrangement and Description of common Plants, both Wild and Cultivated. By Asa Gray, M.D. New York: Ivison and Phinney. 1858.

If Botany is not as much taught in our schools for the young of both sexes, as we might expect from its attractions, and might desire from its lasting and untiring interest, the practical usefulness of many of its facts, and its valuable effect on the mind, regarded as a means of cultivating the faculties, the deficiency can no longer be ascribed to the want of excellent books suited to every stage in the student's progress, and even especially adapted in their choice of illustrations to the country in which we dwell. Besides the various excellent introductory works of some of the leading British Botanists, as Lindley, Balfour, Henslow, and Henfrey, not here to refer to those produced in other countries, we have from the pen of Professor Gray of Harvard University, a series of books of very remarkable merit, their characteristics being a thorough knowledge of the subject in all its aspects; judgment

and skill in the selection and arrangement of materials; a clear, correct and very pleasing style, and an abundance of useful illustrations not repeated or imitated from other works, but drawn generally from nature by a master hand. The highest work in Dr. Gray's series has been longest before the public—has passed through several editions, and has been highly appreciated in Europe as well as in America—contributing its full share, with his labours of another kind, to the establishment of the author's world-wide reputation as a Botanist of the first class. Two years ago this was followed by First Lessons in Botany and Vegetable Physiology, a work intended as a school book, and as an introduction to the use of the author's Manual of the Botany of the Northern United States, and which in our higher schools would be found most valuable, but which, from the fulness, accuracy and judicious arrangement of its materials, its convenient size, and moderate price, is well fitted for a text-book for a junior college class. No sooner was this work issued than the author appears to have turned his thoughts to completing his series of Botanical instruction by a still more elementary volume.—This he has given us in the work now under our consideration—and it is little to say that it is worthy of its predecessors. The dryness and repulsiveness of elementary treatises often arises from their being compiled by those who have not acquaintance with the subject, or strong interest in it, whilst the most extensive knowledge and warmest love of any science are the very qualifications for attracting the mere beginner and offering what is suitable to his wants and capacities. In this little book Dr. Gray seems to have brought together just what is adapted to its object—as much structural botany as is necessary to right ideas of the nature of plants, and the foundations of classification, as much physiology as will be immediately useful, and will create a taste for further knowledge—and as much of system as will render its use familiar, and its utility obvious, leaving difficulties and minute subdivision for a more advanced stage of progress. The object proposed is to give knowledge, which every one needs, and open the way to botanical studies. The object has been accomplished at once effectively and pleasingly. We are persuaded that all real lovers of botanical science, especially on this continent, will feel grateful to the learned professor, for assisting to bring its truths within reach of all, and to render the approach so easy and pleasant to that temple of science, which in his other works he has contributed to strengthen and adorn.

W. H.

MISCELLANEOUS.

TESTIMONIAL TO SIR WILLIAM LOGAN.

The citizens of Montreal, soon after Sir William Logan's return from the Great Paris Exhibition of 1855, resolved to present to him some enduring mark of their estimation for the services rendered by him to the Province, by his valuable labors in connexion with the Exhibition in the Crystal Palace, London, in 1851 and in that more recently held at Paris. In both of these, it is well known that the productions and industrial resources of Canada were brought into notice in a way which materially contributed to the best interests of Canada; and among the wealthy citizens of Montreal no difficulty was experienced in raising the requisite funds. Happily, in giving permanent form to this token of esteem, the distinguished rank attained by Sir William Logan as a man of science, and his valuable services as the Provincial Geologist of Canada, have not been overlooked. The testimonial consists of a massive silver fountain, designed to illustrate the palæontology of the carboniferous era; and to symbolise Sir William's discoveries among the coal formations. This beautiful and appropriate design rests on a pedestal of ebony, intended to represent the bed of coal; and on one of its faces is a plate with the following inscription:

In commemoration of
His long and useful services
as Provincial Geologist in Canada,
and especially his valuable services in connexion
with the Exhibition of all Nations in
London in 1851, and in Paris
in 1855,
by which he not only obtained for himself higher
honor and
more extended reputation, but largely
contributed in making known
the natural resources of his native country
This Testimonial was presented to
SIR WILLIAM E. LOGAN, Knight, F.R.S., F.G.S., LL.D.,
by many of the inhabitants of Montreal,
desirous of marking their respect and regard for
one of the most distinguished of their
fellow-citizens.
Montreal, July, 1856.

On the other sides of the pedestal are designs representing the various modes of vegetable existence from which the deposits of coal have been derived.

The presentation of this beautiful and costly testimonial took place in the Hall of the Natural History Society of Montreal. The Hon. George Moffat presided on the occasion, and the Right Rev. the Lord Bishop of Montreal acted as the

representative of the Committee of the subscribers, and, in the name of the citizens, presented their gift to Sir William Logan, in graceful terms of congratulation and high respect.

Sir William Logan replied:—It is a great satisfaction to me that I should receive from so many of the inhabitants of my native city so distinguished a mark of their regard and approbation, and that it should come through the hands of so eminent and respected a citizen as your Lordship, and in the Hall of the Natural History Society, whose members have already bestowed on me the highest honor within their power. If in the Exhibitions of London and Paris, I was any way instrumental in extending a knowledge of the material resources of Canada, it was chiefly of those more immediately connected with the geological investigation with which I am charged. In respect to other materials, my exertions I fear would have been of little avail, without the practical experience of those associated with me in the management of the Canadian contributions. Those exhibitions involved a very practical purpose, and seeing that what may be called mineral manufactures had extended but little in this country, I rejoiced in the opportunity offered of placing before the eyes of European judges some of the results of the Geological Survey, persuaded that although we could not show that we possessed the skill requisite to give to all our metallic ores and useful rocks the various ultimate forms of which they were capable, we should at least convince the world that Canada contained in her subsoil vast stores of mineral materials that would hereafter become available for the support of native industry. The mere specimens exhibited, however, would have been an ineffectual means of attaining the object, had they not been accompanied by a geological map, showing that geographical distribution of the formations from which the minerals were derived—thus making at once intelligible the position and abundance of those things of which the specimens merely displayed the nature. Successful, however, as our geological contribution proved to be, there was one branch of the subject in which we were deficient: our fossils had not been arranged or described, and it was, in consequence, impossible for us to prove the sequence of our rocks from their position, except by an assertion that was not disputed. I am not myself a naturalist, to describe fossils. For many years of my life engaged in the active pursuits of a practical miner for coal, and a practical smelter of copper from its ores, my connection with geology relates more to the application of materials. But I well know the value of fossils as an indispensable means of research, and unless Canadian fossils are properly described, Canadians will never thoroughly understand their own economic minerals, or even sufficiently know them to protect themselves from imposition; nor will the study of Canadian minerals enter into the educational systems of the country. In the form given to the testimonial which you do me the honor to present to me, it is gratifying to me to observe typified a discovery which, in my pursuits as practical collier, I was so fortunate as to make, by which coal and its associated fossils were drawn into closer relation than had ever been known before. By it the practical researches for coal were greatly facilitated; and, as a practical collier, I can assure you that it is only in a knowlege of the differences that exist between such kind of fossils as this testimonial indicates, and others of a distinct description of organisms, that

you have the most certain means of discriminating between the coal of Newcastle and that of Bowmanville. One pleasing circumstance that attaches to this testimonial is, that amongst those presenting it there are so many engaged in the practical business pursuits of life. It gives me an assurance that they are convinced of the usefulness of geological investigations; and I beg to assure you that, as marking the good will of so many of my fellow-citizens, I shall always regard it with feelings of satisfaction and pride.

CANADIAN INSTITUTE.

Session—1858-59.

FIRST ORDINARY MEETING—*4th December*, 1858.

John Langton, Esq., Vice-President, in the Chair.

I. *The following Gentlemen, provisionally elected by the Council during the recess, were balloted for and declared duly elected Members:*

T. Reynolds, Esq., M.D., Brockville, C.W.
J. J. Burrows, Esq., Kingston, C.W.
Rev. J. Whyte, Osgoode, C.W.
Rev. W. J. Mackenzie, Baltimore, C.W.
J. H. Dumble, Esq., C.E., Cobourg, C.W.

Junior Members:

C. J. Bethune, Esq., Trinity College, Toronto.
G. T. Carruthers, Esq., " "

II. The Donations to the Library and Museum received since the last Ordinary Meeting were announced. The thanks of the Institute were voted to the donors, and detailed lists, with the donors' names, were ordered to be inserted in the Annual Report.

III. *The following Papers were read:*

1. By Prof. E. J. Chapman:
"On the alleged discovery of a *Conus* in the drift of Western Canada."
2. By Prof. D. Wilson, LL.D.:
"On ancient notices of the Beaver in Europe."

SECOND ORDINARY MEETING—*11th December*, 1858.

John Langton, Esq., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

R. S. Bouchette, Esq., Toronto.
G. R. R. Cockburn, Esq., M.A., "
C. W. Connon, LL.D., "
Simon J. Dawson, Esq., Three Rivers.
James Dorland, Esq., Toronto.
Joseph Horrocks, Esq., "

II. *The following Donations for the Library were announced, and the thanks of the Institute voted to the donors:*

From Hon. G. Brown, M.P.P.:

Report on the Exploration of the Country between Lake Superior and the Red River Settlement 1. vol.

From the United States Patent Office, Washington:

United States Patent Office Reports, 1856.
Report on Agriculture. 1. vol.
Reports on Mechanics. 3. vols.

From Prof. A. D. Bache, Superintendent United States Coast Survey:

Report of the United States Coast Survey for 1856. I. Vol.

III. *The following Papers were read:*

1. By the Rev. Prof. W. Hincks, F.L.S.:
"On Canadian Ornithology."
2. By F. Assickinack, Esq.:
"On the Grammatical construction of the Odahwah language."

IV. The requisite nominations for the election of Office Bearers for the ensuing year were made, and the Vice-President announced the Annual General Meeting to be held on the 18th inst., to receive the Report of the Council, to elect the Office Bearers and Members of Council for the ensuing year, and for other business.

A. H. Armour, Esq., gave notice of a motion to take into consideration the propriety of changing the night of meeting from Saturday to some other evening.

ANNUAL GENERAL MEETING—*18th December*, 1858.

JOHN LANGTON, Esq., Vice-President, in the Chair.

I. *The following Gentlemen were elected Members:*

Admiral BAYFIELD, Royal Navy, *Honorary Member.*
J. F. SMITH, Esq., Jun., Toronto.
W. G. BELLAIRS, Esq., C.E., "
JAMES THORBURN, Esq., M.D., "

II. On the motion of A. H. Armour, Esq., it was ordered that a circular be sent to each member of the Institute residing in Toronto, intimating that the proposal to change the night of meeting from Saturday to another evening will be discussed at the meeting on the 8th January, 1859.

III. *A ballot having been taken for Officers of the Institute for the ensuing year, the following Gentlemen were duly declared elected, viz.:*

President,	Hon. G. W. ALLAN, M.L.C.,
1st. Vice-President,	JOHN LANGTON, M.A.,
2nd. Vice-President,	Prof. D. WILSON, LL.D.,
3rd. Vice-President,	Rev. Prof. W. HINCKS, F.L.S.,
Treasurer,	D. CRAWFORD, Esq.,
Corresponding Secretary,	Prof. J. B. CHERRIMAN, M.A.,
Recording Secretary	THOMAS HENNING., Esq.,

Curator, ...J. F. Smith, Esq.,
Librarian, ...Prof. H. H. Croft, D.C.L.,
Council, ...Prof. E. J. Chapman,
" ....Prof. G. T. Kingston, M.A.,
" ....William Hay, Esq.,
" ....Patrick Freeland, Esq.,
" ....Andrew Russell, Esq.,
" ....Sandford Fleming, Esq.

IV. It was moved by F. W. Cumberland, Esq., seconded by A. H. Armour, Esq., and unanimously adopted:

That the thanks of the Institute be tendered to the President and Vice-Presidents, and members of the Council for their valuable services during the past year.

V. The Report of the Council for the year 1857–58, was then read and adopted:

ANNUAL REPORT OF THE COUNCIL, FOR 1858.

The Council of the Canadian Institute, at the expiration of their term of office have the honor to present the following Report upon the progress of the Institute during the past year.

The number of members has gone on steadily increasing, the total number on the books on the 30th of November being 650.

Total number of Members at commencement of Session 1857–8		614
New Members elected during Session 1857–8	45	52
" " by Council during recess	7	
		666
Deduct left the Province or withdrawn		16
Total, 30th November, 1858		650

Composed of—Honorary Members	4	
Life Members	36	
Corresponding Members	5	
Junior Members	24	
Members	581	
		650

The following is a list of the various books added to the Library by purchase or otherwise, during the year:

BOOKS PURCHASED.

Books marked (*) are in parts, or unbound.

	Vols.
Tredgold's Tracts on Hydraulics	1
Tredgold on Carpentry	1
Nicholson's Operative Mechanic. Vols. 1 and 2	2
Turnbull's Strength of Timber	1
Smeaton's Civil Engineering	1

	Vols.
History of the Indian Tribes of North America; with Biographical Sketches and Anecdotes of the principal Chiefs. By Thomas L. McKenny and James Hall	3
Descriptive Catalogue of the Osteological Series contained in the Museum of the Royal College of Surgeons of England. Vols. 1 and 2	2
Siluria. By Sir Roderick Impey Murchison, &c., &c. Vol. 1	1
Collected Works of Dugald Stewart. Vol. 10	1
Encyclopædia Britannica. Eighth Edition. Vols. 14–16	3
Herodotus. By G. Rawlinson. Vols. 1 and 2	2
Carlyle's Frederick the Great. Vols. 1 and 2	2
Westminster Review, 1856 and 1857	2
Edinburgh Review, 1856 and 1857	2
London Quarterly Review, 1857	1
Blackwood's Magazine, 1857	2
North British Review, 1856 and 1856–7	2
Journal of Education for Upper Canada, 1857	1
Journal de l' Instruction Publique. Vol. 1. 1857	1
Hunt's Merchants' Magazine. July—Dec., 1857; Jan.—June, 1852	2
Journal of the Franklin Institute. July—December, 1857	1
Canadian Merchants' Magazine. Vol. 1	1
Silliman's Journal. Vol. 24; July—November, 1857. Vol. 25; January—June, 1858	2
Journal of the Society of Arts. Vol. 5	1
Civil Engineers' and Architects' Journal. Vol. 20. 1857	1
The Art Journal, 1857	1
The Athenæum, 1855 and 1857; and 1st Vol., 1858	3
The Builder. Vols. 11 and 15	2
Illustrated London News. July—Dec., 1857; Jan.—June, 1858	2
Mining Journal, 1857	1
Artizan, 1857	1
	49

DONATIONS OF BOOKS TO THE LIBRARY.

From the Hon. J. M. Brodhead, *Washington, per A. H Armour, Esq.*

Patent Office Reports, 1856. Mechanics. Vols. 1, 2, and 3	3
———— Agriculture	1
Report of the Commercial Relations of the United States with all Foreign Nations. Vol. 4	1
Commercial Relations. Part II. Tariffs. Vol. 2	1
———— Part III. Returns. Vol. 4	1
Explorations for a Railroad Route from the Mississippi River to the Pacific Ocean. Vols. 2, 3, 4, 5 [two], 6 [two], and 7	8
Reports of the United States and Mexican Boundary Survey. Vol. 1	1
Report of the Military Commissioners to the European Seat of War, in 1855 and 1856. By Capt. G. B, McClellan, U.S.A.	1

	Vols
Navy Register, United States, 1858	1*
Army Register, " 1858	1*

From the Hon. Sir J. B. Robinson, Bart., *Chief Justice of Upper Canada.*

Agassiz's Contributions to the Natural History of the United States. Vols. 1 and 2	2

From the Clerk of the House of Assembly.

Maps appended to the Report of the Commissioners of Crown Lands, included in Appendix No. 25. Vol. 15. No. 5, 1857. Appendices 1, 7, 8, 9, 10; 1857	6
Trade and Navigation, 1857	1
Plans appended to the Geological Reports, 1857	1
Journals of the Legislative Assembly. Vol. 16. Part I. 1858	1
——— " Part II. 1858	1
Statutes of Canada, 1858	1

From Crosby, Nichols & Co., *Publishers, Boston.*

American Almanac for 1858	1
Mabel Vaughan	1

From J. F. Smith, *Esq., Jun., Toronto.*

Descriptive Guide to the Museum of Practical Geology, London	1*
The Hindostanee Interpreter	1*

From Regents *of University of the State of New York.*

Documents relative to the Colonial History of the State, &c. Vol. 10	1
Census of the State of New York, 1855	1

From the Provincial Secretary.

Relations des Jésuites contenant ce qui s'est passé de plus remarquable dans les Missions des Pères de la Compagnie de Jésus	3*

From the University of Michigan.

Catalogue of Students and Officers of the University of Michigan, 1858	1*

From The Hon. George Brown, M.P.P.

Logan's Geological Survey, 1853—1856	1*
Plans of various Lakes and Rivers, between Lake Huron and the River Ottawa, to accompany above Reports	1

From A. Russell, Esq., *Assistant Commissioner Crown Land Department.*

Do. do. as presented by Mr. Brown	2

From H. G. Bohn, Esq., *London, per A. H. Armour, Esq.*

England under the Stuarts. Vols. 1, 2, and 3 .... Historical Library	3
Burke's Speeches. Vols. 1 and 2 .... British Classics	2
De Foe's Works; Duncan Campbell; Voyage round the World "	1
Wright's Provincial Dictionary. Vol. 1, A—F; Vol. 2, G—Z. Philological Library	2
Lamartine's Restoration of the French Monarchy. Vols. 1, 2, 3, and 4. Standard Library	4

Vols.

Foster's Critical Essays. Vol, 2.......................... " 1
Fosteriana; Thoughts; &c,.............................. " 1
Luther's Table-Talk; by A. Chalmers .... " 1
Sturm's Morning Communings .... " 1
Charles II. and James II. Carrel, Fox, and Lonsdale .... " 2
Mantell's Wonders of Geology, &c. Vols. 1 and 2.. .... Scientific Library 2
Carpenter's Zoology. Vols. 1 and 2 .... " 2
Manual of Technical Analysis. Bolley and Paul .... " 1
Index of Dates. A—J. Vol. 1. By J. W. Rosse ...... " 1
Pliny's Natural History. Vol. 6.......................... Classical Library 1
Strabo. By Falconer and Hamilton. Vol. 3 .... " 1
Aristotle's Metaphysics, with Analysis, &c. .... " 1
Pettigrew's Collection of Epitaphs .... Antiquarian Lib. 1
Polyglot of Foreign Proverbs .... " 1
Hegel's Philosophy of History .... Philosophical Lib. 1
Stuart's Antiquities of Athens............................Illustrated Library 1
Pope's Homer's Odyssey. Designs by Flaxman ... . " 1
——————— Iliad. " " .... " 1
——————— Life and Letters. Carruthers........... " 1
The Holy Land. Lord Lindsay .... " 1
Tales of the Genii. Illustrated......................... " 1
Nineveh and its Palaces. Bonomi .... " 1
Pottery and Porcelain. Bohn.......................... " 1
The Bibliographer's Manual of English Literature. By W. T. Lowndes. Part I.... 1
Lion Hunting and Sporting Life in Algeria. By Jules Gerard 1
Washington Irving's Life of G. Washington. Vol. 4...................... 1
Philosophy of Temperance and Total Abstinence. By W. B. Carpenter, M.D. 1*

From Leonard Scott & Co., *New York, per A. H. Armour, Esq.*

Edinburgh, Westminster, North British, and Quarterly Reviews for 1858.*
Blackwood's Magazine for 1858.*

From G. D. Gibb, Esq., M.D., *London, England.*

Presidents' Anniversary Addresses delivered before the Geological Society of London, from 1846 to 1857 (the years 1847 and 1851 excepted)........ 9*

From the Author, A Member of the Press.

The Hand-Book of Toronto, 1858 1

From Hon. East India Company, *London.*

Magnetical and Meteorological Observations, Bombay. Years 1854, '55, '56. 3

From A. & C. Black, *Publishers, per J. C. Geikie, Esq.*

The Student's Manual of Geology. Jukes 1
Elements of Mineralogy. Nicol 1
Review of the Progress of Mathematical Science in more recent times. Forbes 1

From the Societies.

Transactions of the Royal Society of Edinburgh. Vol. XXI, Part 4, Session 1856–7 .... 1*

	Vols.
Proceedings of the Royal Society of Edinburgh. Session 1856–7..........	1*
Transactions of the Academy of Science of St. Louis, 1858. Vol. I. No. 2..	1*
Proceedings of the Essex Institute, Salem, Massachusetts. Vol. I. 1848 to 1856; and Vol. II. Part 1, 1856 to 1857..........................	2*
Proceedings of the Society of Antiquaries of Scotland. 76th Session, 1855–'56. Vol. II. Part 2..	1*
Catalogue of the Antiquities of Stone, Earthen, and Vegetable Materials in the museum of the Royal Irish Academy. By W. R. Wilde, M.R.I.A., Secretary of Foreign Correspondence................................	1*
Bulletin de la Société Géologique de France. Tome treizième. Feuilles, 37–49 (21 Avril, 16 Juin, 1856)................................	1*
Do. Feuilles, 19–23 (15 Déc, 1856, 19 Janv, 1857)......................	1*
Do. " 50–56 (7–14 Sept. 1856)..	1*
Report General Committee of Mechanics' Institute, Toronto, ending May 3rd, 1858..	1*
Catalogue of Books in Library of ditto..................................	1*
Address to Co. of Simcoe Mechanics' Institute, Barrie, by J. Ardagh, M.D.	1*
Report, 4th Annual, Trinity College Literary Institute....................	1*
Report on the Sewerage of Chicago, from the Board of Commissioners......	1*
Dynamics of the Mississippi, from the New Orleans Academy of Sciences..	1*
Annual Address, 1856, New Orleans Academy of Sciences..................	1*
Report of Special Committee, on the subject of a Geological and Scientific Survey of the State of Louisiana..................................	1*
Sketch of General Jackson, by himself..................................	1*
Journal of the Franklin Institute..	12*
Artizan..	12*
Journal of the Society of Arts. 2 sets..................................	*
Silliman's American Journal..	6*
Canadian Naturalist and Geologist......................................	6*
Queen's Bench Reports..	10*
Upper Canada Reports, No. 7. Vol. VI..................................	1*
Boston Natural History Society. Pages 273 to 400..................	In sheets
The Atlantis. Nos. 1 and 2, January and July, 1858......................	2*
Journal of the Geological Society of Dublin. Vol. VII. Part 5............	1*
Plates 8 and 9..	2 plates.
Do. Vol. VIII. Part 1..	1*
Proceedings of the Dublin Natural History Society. Session 1855–6........	1*
The Geologist, a Monthly Magazine. J. S. Mackay, F.G.S................	1*

From Superintendent of Education, *Upper Canada.*

Journal of Education. Two sets..	24*

From Publisher, John Lovell, Esq., *Montreal.*

Nova Britannica, or British North America. A Lecture by A. Morris, M. A., Advocate..	1*
Prof. Henry Y. Hind's Maps of Valley of Red River, North of 49th parallel, to accompany the Report of the Exploring Expedition, 1857...........	2

Vols.

From Mr. B. Quaritch, *London, England.*

Catalogue Raisonné 2*

Unknown.

Proceedings of the Dedication of Plummer Hall, Salem 1*
Report of Public Meeting of Delegates, Toronto, 14th April, 1858. Protection of Canadian Industry 1*

From Thomas Brett, Esq.

A Treatise on Light, Vision and Colours 1*

From Superintendent of Education, *Lower Canada.*

Report on Education, Year 1856 .... 1*
Mémoire sur la Plante Gin-Seng de Tartarie 1*
Journal of Education, Lower Canada 12*
Journal de l'Instruction Publique, Bas Canada 12*

DONATIONS TO THE MUSEUM.

From a Member Anonymous.

A Curious Bird's Nest, from Neighbourhood of Calcutta 1

From C. Rankin, Esq., *per A. Russell, Esq., A.C.C.L.D.*

A piece of Elastic Sandstone from Delhi 1

From Major Lachlan, *Cincinnati, Ohio.*

Horned Frog from California 1
Box of Minerals, and other objects, with descriptive Catalogue ...... 60 parcels

From J. F. Smith, Esq., Jr., *of Toronto.*

Piece of Fossil Bone, from the Collection of the late Dr. Buckland 1
A piece of the Atlantic Cable. Newell & Co., Manufacturers, Birkenhead .. 1
Eighteen Specimens of Shells from the Chalk of Kent and Sussex, England .. 18

From A. McDonald, Esq., *Glengarry, C. W.*

Copper Penny Piece, with Globe on Reverse 1

From A. H. Armour, Esq., *Toronto.*

Several Geological Specimens from shores of Lakes Superior and Huron, in all 10

From J. Davidson. Esq., *per A, H. Armour, Esq.*

Several Specimens of Copper Ore and other Minerals from Bruce Mines, in all 30

From C. Unwin, Esq., *Toronto.*

Loon's Eggs, Two, from Gull Lake, Canada West 2

COMMUNICATIONS.

The subjoined list contains the titles of the various Papers read at the ordinary meetings of the Session, 1857-8:

Sir W. Logan, F.R.S.—"On the Relative Dates of various Intrusive Rocks cutting the Laurentine Series in Canada West." 5th Dec., 1857.

B. O'Hara, Esq.—"On a new form of Propelling Power for Steamships." 5th Dec., 1857.

Prof. Wilson, LL.D.—"On some Ethnographic Phases of Conchology." 5th Dec., 1857.

Rev. Prof. W. Hincks, F.L.S.—"Notices respecting the Flora of Western Canada, especially the Neighbourhood of Toronto." 12th Dec., 1857.

Rev. J. McCaul, LL.D.—"Notes on Ancient Inscriptions found in Britain." 12th Dec., 1857.

Prof. J. B. Cherriman, M.A.—"On the Pythagorean Proposition." 19th Dec., 1857.

Prof. Kingston, M.A.—"On Reducing Mean Temperatures." 19th Dec., 1857.

The Hon. The Chief Justice Draper, C.B.—Annual Address. 9th Jan.. 1858.

Prof. Croft, D.C.L.—"On the Oxidation of Arsenious Acid." 9th Jan., 1858.

F. Assickenack.—"On the Legends of the Ottawa Indians." 9th January, 1858.

Prof. Kingston, M.A.—"Meteorology." 9th January, 1858.

Prof. Chapman.—"On the Assaying of Coals by the Blow Pipe, with remarks on Blow Pipe Examinations in General." 16th January, 1858.

Rev. Prof. Hincks, F.L.S.—"Notice respecting a Collection of Mazatlan Shells recently obtained by the University of Toronto." 16th January, 1858.

Prof. Wilson, LL.D.—"Notes on the American Cranial Type." 23rd Jan., 1858.

Prof Kingston, M.A.—"Annual Meteorological Report." 23rd January, 1858.

Thos. Hector, C.E.—"Scale for Computation of Areas of Irregular Figures," 30th January, 1858.

Col. Baron de Rottenburg, C.B.—"Observations made at Toronto on Solar Spots in the month of January, 1858." 30th January, 1858.

Prof. Croft. D.C.L.—"On the Purification of Sulphuric Acid for Toxicological Investigations." 30th January, 1858.

S. Fleming, C.E.—"On a Method of Launching Large Vessels." 30th January, 1858.

Rev. J. McCaul, LL.D.—On Latin Inscriptions found in Great Britain." 6th February, 1858.

S. Fleming, C.E.—"Note on an improved kind of Rail. 13th February, 1858.

Prof. Henry, LL.D.—"Application of Acoustics to Public Buildings, as illustrated in the Lecture Room of the Smithsonian Institution at Washington." 13th February, 1858.

Prof. J. B. Cherriman, M.A.—Description of the Observatory at St. Martin's." By Dr. Smallwood. 20th February, 1858.

Col. Baron de Rottenburg, C.B.—"Some Astronomical Notes." 20th Feb., 1858.

Rev. Prof. Kendall, B.A.—"Geometrical Notes." 20th February, 1858.

A. Coulon, C.E.—"Road and Railway Calculations." 27th February, 1858

Prof. J. B. Cherriman, M.A.—"On Climatology." By Prof. Henry. 27th February, 1858.

J. Hudson, Esq.—"A Plan for Laying down the Atlantic Cable by means of a Buoy." 27th February, 1858.

Prof. Wilson, LL.D.—"On the True Value of the Colon as a Mark of Punctuation." 27th February, 1858.

Rev. D. Inglis, M.A.—"On the Relation of Quantity to the Æsthetic Sentiment." 6th March, 1858.

Rev. Prof. Hincks, F.L.S.—"Considerations respecting Anomalies of Vegetable Structure, their causes, scientific importance, proper arrangement, and some of the conclusions derived from them, or supported by them." 6th March, 1858.

Prof. Hind, M.A.—"On Ancient Lake Ridges and Beaches in the Valley of the Red River." 13th March, 1858.

Prof. T. Sterry Hunt.—"Considerations on the Theory of Igneous Rocks and Volcanoes." 12th March, 1858.

Col. Baron de Rottenburg, C.B.—"Remarks on the Spots now visible on the Sun's Disc." 13th March, 1858.

Rev. Prof. Hincks, F.L.S.—"On the Classification of Mammalia." 20th March, 1858.

Prof. Chapman.—"On a New Trilobite from Canadian Rocks, with some additional Remarks on Asaphus Canadensis." 20th March, 1858.

Prof. Croft, D.C.L.—"On some Compounds of Palladium." 20th March, 1858.

Rev. J. McCaul, LL.D.—"On Roman Military and Naval Epitaphs." 27th March, 1858.

T. Henning, Esq.—"Inquiry into the means of rendering our Educational System applicable to the social condition of large Cities. 27th March, 1858.

Rev. Prof. Young, M.A.—"On the Impossibility of Representing by Algebraical Functions the Roots of Equations of a higher order than the fourth." 10th April, 1858.

F. W. Cumberland, C.E.—"Some Notes on the Paper read by Mr. Henning on our Educational System." 10th April, 1858.

F. W. Cumberland, C.E.—"Notes on the Course of the Western Trade Eastward, to the Atlantic." 17th April, 1858.

The Council submit the Reports laid before them by the Editing Committee, and the Treasurer and Auditors:

REPORT OF THE EDITING COMMITTEE.

The Editing Committee beg to Report the completion of the third volume of the Canadian Journal, in accordance with the principles adopted by the Council of the Canadian Institute, after mature consideration, when it was resolved to bring the former series to a close. The continued success of the Journal is such, they believe, as amply to justify the decision of the Council, presented in their Annual Report for 1855, in accordance with which it has since been conducted, in its new form, as a Provincial medium for original Scientific and Literary Articles, and an embodiment of the proceedings of the Institute. The instructions originally reported by the Council, for the guidance of the Editing Committee in conducting the New Series, have required no modification during the past year; and the original Articles and Reviews have been continued as in former years, so as to give a distinctive character to the Journal as a Canadian Periodical, furnishing to the Students of Science, and the Literary Men of the Province, a medium for the interchange of communications among themselves, as well as for opening up an intercourse between them and the Scientific Men of Europe and America.

In furtherance of the objects referred to, and in accordance with the resolution of the Council relative to the gratuitous distribution of the Journal, the Editing Committee have added the following Societies and learned bodies to the free list furnished in last report:

Linnæan Society, London.
Royal College of Surgeons, London.

Athenæum Club, London.
The Academy of Sciences, St. Louis, Missouri.
Essex Institute, Salem, Massachusetts.
Historical Society, Chicago, Illinois.

Owing to the absence of three of the Members of the Editing Committee in Europe, for some months during the past summer, and the departure of another as a member of the Commission appointed by the Provincial Government to Survey and report on the means of access and settlement at the Red River, it has been impossible to hold the regular meetings of the Editing Committee, as in former years, but only a slight interruption has been thereby occasioned to the regular issue of the Journal.

During the past year the sum of £36 15s. has been expended on illustrations for the Journal, and the entire cost of its publication for the year amounts to £266 17s. 5d., a sum very slightly in advance of the outlay of former years.

In the numbers now completed, forming the third volume of the New Series, 26 original papers have been printed, 22 of which have been selected from those communicated to the Institute during the meetings of the Session of 1857–8. Twenty-four articles, in the form of Reviews, have also furnished an amount of original material, in some cases not inferior in value to any of the papers in the department of Communications. For valuable contributions to this department, the Editing Committee have to record their obligations to Dr. Wm. Sutherland, of Montreal, the Rev. Professor Young, Professor Kingston, Professor Buckland and the Rev. Dr. O'Meara.

The Scientific and Literary Notes have been continued, as in former years, and embrace contributions fully equal to those included under the same head in previous volumes. The Committee have only to regret that in this, as in all other departments of the Journal, they continue to receive so few additions, in the form of contributions, from the members at large. Such communications they would once more earnestly invite from the Members, and other intelligent observers, as welcome additions to the Journal which represents, for Upper Canada at least, the scientific industry and research of the Province.

Toronto, 9th December, 1858. DAN. WILSON, *Convener.*

TREASURER'S REPORT, 1858.

Statement of the Canadian Institute General Account for 1858.

DR.

Cash, balance from last year	£178	12	10	
" received from Members	289	12	0	
" for sale of Journal	54	1	0	
" Parliamentary Grant for 1858	250	0	0	
" Athenæum Grant for 1855	100	0	0	
" Mrs. Blunt's Readings	20	15	0	
Arrears due by Members of the Institute	406	7	6	
" for sale of Journal—old series	24	15	0	
" " new series	52	17	6	
				£1377 0 10

CR.

Cash paid on account of publication of the Journal—

1857	£44	4	6½						
1858	196	17	5						
				241	1	11½			
Cash paid on account of Library and Museum........				133	9	1			
" paid on account of Sundries..................				342	13	2½			
" paid to Mrs. Blunt				25	0	0			
" due on account of publication of the Journal....				70	0	0			
" due on account of sundries—estimated..........				15	0	0			
Estimated balance in favour of the Institute				549	16	7			
							£1877	0	10

Statement of the Building Fund.

Cash, balance from last year	1568	9	10			
" received for Interest on loans	94	19	5			
" due for Interest on loans	83	17	6			
" on Subscription list	534	15	0			
				2282	1	9

The Treasurer in account with the Canadian Institute.

DR.

Cash, balance from last year	178	12	10			
" Securities	1600	0	0			
" received from Members	289	12	0			
" received for sale of Journal	54	1	0			
" Parliamentary Grant for 1858	250	0	0			
" Athenæum Grant for 1855....................	100	0	0			
" Mrs. Blunt's Readings	20	15	0			
" Interest on Investments......................	94	19	5			
				2588	0	3

CR.

Cash paid on account of the publication of the Journal	241	1	11½			
" paid on account of Library and Museum.......	133	9	1			
" paid on account of sundries	342	13	2½			
" paid to Mrs. Blunt	25	0	0			
Securities	1425	0	0			
Balance	420	16	0			
				£2588	0	3

From the estimated balance of £549 16s. 7d. in favour of the General Account of the Institute, a liberal margin must be allowed for the non-payment of subscriptions due by Members, and cash due on account of the Journal. The sum of £406 7s. 6d. in arrear of Members' subscriptions, has been accumulating since 1852; but the larger portion of that amount is due for the past three years, and may still be collected. £24 15s, not paid, on account of the old series of the Journal, has been outstanding a considerable time, and will probably not be paid. In the Building Fund Account, credit is taken for £534 15s. on a subscription list now of an old date, and unless soon called in, cannot be relied on as an asset. This fund has increased since the last Annual Meeting by interest on investments only.

December 1st, 1858. D. CRAWFORD, *Treasurer*.

AUDITORS' REPORT, 1858.

The undersigned Auditors have to Report that they have examined the Vouchers with the Cash Book, and find them correct. Balance in the hands of the Treasurer, £420 16s.; and the sum of £1,425 invested on Securities, shewn to us.

Toronto, Dec. 9th, 1858.

SAMUEL SPREULL, } *Auditors.*
ROBERT SPRATT, }

Referring to the details above given, the Council believe that they may report satisfactorily upon the general progress and condition of the Institute. The accession of new Members has kept pace with that which has formed a subject of congratulation in former years; and with it the means at the disposal of the Institute have received a corresponding increase, although not equal to the loss which has been sustained by the withdrawal of the Government Grant formerly made to the Toronto Athenæum, which we have enjoyed since the amalgamation of the two Institutions. The Library is annually becoming a more important feature of the Institute, numbering at present upwards of 2,000 volumes, which since the publication of the Catalogue have become more generally accessible. The Journal, under the zealous editorship of Dr. Wilson and his colleagues, has maintained the reputation which it had previously established; and the papers which have been read at the ordinary meetings will compare favourably with those of former years. The list of papers also exhibits some indications of an advance in the direction to which successive Councils have endeavoured to guide the development of increasing activity in the Institute, inasmuch as a larger proportion of the names of contributors belong to members unconnected with the management of the Journal. It is still, however, a matter of regret that so large a share of the business of the Institute in this respect falls upon a few individuals, and that the original communications read at the ordinary meetings would fail to supply the requisite amount of matter for the Journal of the Institute without a very considerable addition of articles by members of the Editing Committee.

JOHN LANGTON,
Vice-President.

Toronto, December 4th, 1858.

VI. *The following Papers were read:*

1. By Prof. E. J. Chapman:
"On a new species of Asaphus," to which he has given the name of "Asaphus Hincksii."
2. By W. Weir, Esq.:
"On the manufactures of Canada."

METEOROLOGY.

MEAN METEOROLIGICAL RESULTS—TORONTO—FOR THE YEAR 1858.

The mean temperature of the year 1858 was 44.74°, being 2.01° higher than that of the preceding year, and 0.64° above the average of 19 years.

The mean temperature of the four seasons was as follows:

For the Winter, including Dec., 1857, 26.29° which is 4.90° higher than that of the preceding Winter, and 2.08° above the average.

For Spring, 39.60° which is 2.25° higher than that of the preceding Spring, and 1.07° below the average.

For Summer, 67.21° which is 3.88° higher than that of the preceding Summer, and 2.34° above the average.

For Autumn, 47.35° which is 1.48° higher than that of the preceding Autumn and 0.68° above the average.

The mean temperatures of the several months were in eight instances above and and in four below the averages for those months. July and February were as usual the warmest and coldest months as compared with other months in the year; but estimated by the deviation of their temperatures from their respective averages, January was the warmest month and February the coldest.

The mean temperature of the warmest day, which was 79.98°, exceeded the nineteen years average by 2.56°. It occurred on June 26, which is 24 days earlier than the *average* date of the warmest day, but 32 days earlier than its *normal* date, or date derived from the *normal* curve of temperature for Toronto, a curve in which by the employment of five day groups accidental irregularities are eliminated. The mean temperature of the coldest day, which was + 1.60°, exceeded the average by 1.8°. It occurred on Feb. 17, which is 22 days later than the *average* date of the coldest day, and 3 days later than the *normal* date of the coldest day.

The highest temperature of the year was 90.2°, or 0.5° lower than the average maximum of 19 years. It occurred on June 26, already mentioned as the warmest day, and 30 days earlier than the averarge date of its occurrence. The minimum temperature of the year was —7.3° or 3.8° higher than the average minimum. It occurred on Feb. 17, already mentioned as the coldest day, or 24 days later than the date at which, on the average, the absolutely lowest temperature has occurred. The range of temperature for the whole year, 97.5°, was less than the average by 4.2°.

Humidity.—The mean humidity of the year was 0.78, the greatest monthly humidity being in December, and the least in April, facts which conform very nearly to the experienee of the past eighteen years, which give January and May as the dampest and driest months as regards the vapour suspended in the atmosphere. There were but three instances of perfect saturation, one in November and two in December, and the day when on the whole the atmosphere was most damp was March 15, when the mean humidity was .96. The instance of greatest atmospheric dryness was .08, at 4 p.m. of April 16; and the dryest day on the whole was May 3, with a mean humidity of .39.

Clouds.—The extent of sky clouded was on the average $\frac{3}{4}$ of the whole hemisphere, and for nine months the sky was on the average at least half over-cast December was the most cloudy month, and September the month most free from clouds. This harmonises with experience as regards December, but the month in hich on the whole clouds usually prevail least is July. Considered with refer-

ence to the different hours of the day, 2 p. m. and midnight were the hours at which the extent of sky clouded was greatest and least.

Wind.—The resultant direction of the wind for the year was considerably more from the west, and the resultant velocity as well as the mean velocity was much less than in the preceding three years. The most windy month was April, with a mean velocity 9.57 miles per hour, and the least windy month was June, with a mean velocity 5.33. The most windy day was 21st March, with a mean velocity of 23.62 miles, and the most windy hour absolutely was from 3 to 4 p, m. on the same day, when the velocity was 35.4 miles. The most windy hour on the average of the year was from 2 p. m. to 3 p. m., with a mean velocity of 10.51 miles, and the least windy hour from midnight to 1 a. m., with a mean velocity of 5.88 miles,

Rain and Snow.—The depth of rain, 23.051 inches was 2.674 inches below the average, and the depth of snow 45.4 inches or 16·2 less than the average. The total depth of rain and melted snow thus fell short of the average by nearly 4.3 inches.

May was the most rainy month, estimated by the quantity of rain that fell, but considered with reference to the number of rainy days, October and May were equally rainy. February was in both respects the least rainy month. The most rainy day was May 11, when the depth of rain was 1.590 inches, and the days on which the heaviest fall of snow occurred were February 1 and 13, on each of which days it fell to the depth of 6 inches.

The fall of rain was distributed over 131 days, and the fall of snow over 67 days, including some days enumerated as days of rain ; and there were 178 days without either rain or snow. The rain occupied about 584 hours, and the snow about 277 hours in its fall, giving thus a total of 861 hours, or nearly 36 days, or nearly one-tenth of the year when either rain or snow was actually falling.

The hour when rain was most frequent through the year was 1 p. m. to 2 p. m., the hours at which snow was most frequent were from 10 a. m. to 11 a. m., and from 1 p. m. to 2 p. m.; and the hour most subject either to rain or snow was from 1 p. m. to 2 p. m.

The hours most free from rain and snow considered separately, were from 10 a.. m. to 11 a. m,, and from 6 p. m. to 7 p m. for rain, and from midnight to 1 a. m. for snow; and the hour most free from rain and snow taken collectively was from midnight to 1 a. m.

Thunderstorms.—There were but 19 thunderstorms, reckoning as such those cases in which thunder or lightning occurred accompanied by rain or hail; but there were besides 31 instances in which thunder and lightning occurred separately or together, but unaccompanied by either rain or hail.

Auroras.—Auroras were more frequent than during the preceding five years, and that of Oct. 27 exceeded in brilliancy any that were observed within that period.

From the foregoing statements, as well as from the accompanying table, it would appear that 1858 may on the whole be characterized as a moderate and average year, the most marked exception being the early date of the maximum of summer heat, the somewhat scanty supply of rain and snow, taking one month with the other, and its unusually large amount in the month of May.

G. T. K.

GENERAL METEOROLOGICAL

Provincial Magnetical Observatory,

LATITUDE, 43° 39' 4" North. LONGITUDE, 5 h. 17 m. 33 s. West. ELEVATION ABOVE

	Jany.	Feby.	March.	April.	May.	June.
Mean Temperature	° 30 03	° 16.98	° 28.44	° 41.46	° 48.90	° 66.15
Difference from average (19 years)	+ 6.45	— 5.68	— 1 31	+ 0 38	— 2.28	+ 4.72
Thermic Anomaly (Lat. 43° 40' N.)	— 2.77	—17.72	-11.66	- 8.74	- 9.20	+ 1 56
Highest Temperature	47.4	42 4	55 4	65 2	69 8	90 2
Lowest Temperature	6.5	— 7 3	— 5 5	21 8	31 0	42.5
Monthly and Annual Ranges	40.9	49 7	60 9	43.4	38 8	47.7
Mean Maximum Temperature	35 27	24 11	37 01	48 32	55 74	73 94
Mean Minimum Temperature	23.73	10 85	21 93	34 15	41 68	56.41
Mean Daily Range	11 54	13 26	15 08	14 16	14 06	17 54
Greatest Daily Range	25.5	25.0	25.4	24.6	25 0	26.4
Mean Height of Barometer	29.6753	29.6603	29.6197	29.4997	29.5838	29.6057
Difference from average (12 years)	+.0465	+.0478	—.0117	1084	+ 0003	+.0259
Highest Barometer	30.408	30 060	30 159	30.006	30.198	29.891
Lowest Barometer	28 973	28 940	28.849	29 011	29 032	29.147
Monthly and Annual Ranges	1.435	1 120	1 310	0 995	1 166	0.744
Mean Humidity	.78	.77	.69	.68	69	.69
Mean Elasticity of Aqueous Vapour	0.134	0.080	0.119	0 176	0 239	0.465
Mean of Cloudiness	0.61	0.69	0.50	0.65	0.69	0.48
Resultant Direction of the Wind	N 71 W	N 72 W	N 58 W	N 14 W	N 42 E	S 20 E
Resultant Velocity of the Wind	2.39	3 24	5 45	1.64	3 33	0 25
Mean Velocity (Miles per hour)	7.40	0 12	8 56	9.57	9.30	5 53
Difference from average (11 years)	—0.14	+1.37	+0.66	+2 23	+2.83	+0.73
Total Amount of Rain (in inches)	1.152	Inapp.	0 917	1.642	6.567	2.948
Difference from average (18 or 19 years)	—0.329	-1.076	0 497	—0 840	+3.007	—0.268
Number of Days Rain	6	1	10	13	17	12
Total Amount of Snow (in inches)	4.0	26 7	0.2	0.1	......	......
Difference from average (16 years)	—9.32	+8 34	—9 56	—2.35	—0 09	......
Number of Days Snow	11	16	6	2	......	......
Number of Fair Days	15	12	16	15	14	18
Number of Auroras observed	3	6	4	4	5	4
Possible to see Aurora (No. of Nights)	17	11	19	17	17	20
Number of Thunderstorms	0	0	0	1	2	7

REGISTER FOR THE YEAR 1858.

Toronto, Canada West.

LAKE ONTARIO, 108 feet. APPROXIMATE ELEVATION ABOVE THE SEA, 342 feet.

July.	Augst.	Sept.	Oct.	Nov.	Dec.	Year 1858.	Year 1857.	Year 1856.	Year 1855.	Year 1854.	Year 1853.
67°.86	67°.61	59°.11	48°.79	34°.16	27°.40	44°.74	42°.73	42°.16	43°.98	45°.21	44°.78
+ 0.79	+ 1.51	+ 0.98	+ 3.40	— 2.33	+ 1.01	+ 0.64	— 1.34	— 1.99	— 0.29	+ 0.87	+ 0.44
— 0.84	— 0.89	— 2.39	— 5.01	— 9.04	— 8.60	— 6.26	— 8.27	— 8.84	— 7.02	— 5.79	— 6.22
85.0	84.0	81.4	76.3	53.0	45.4	90.2	88.2	96.6	92.8	99.2	94.9
52.0	44.0	35.6	31.5	15.3	4.2	— 7.3	—20.1	—18.7	—25.4	—10.8	— 9.7
33.0	40.0	45.8	44.8	37.7	37.7	97.5	108.3	115.3	118.2	110.0	104.6
75.44	75.38	67.52	55.79	37.90	33.19	......	......	......	......	......	......
59.98	59.21	50.79	43.41	30.03	21.37	......	......	......	......	......	......
15.45	16.17	16.73	12.37	7.87	11.82	13.84	16.38	18.29	18.19	19.77	16.89
24.6	31.2	29.0	24.0	17.3	27.3	31.2	37.0	44.2	39.4	44.5	40.9
29.6052	29.6194	29.6499	29.6813	29.6267	29.6943	26.6267	29.6054	29.5999	29.6249	29.6077	29.6299
+.0079	—.0167	—.0042	+.0415	+.0079	+.0480	+.0068	—.0145	—.0200	+.0050	—.0122	+.0100
29.915	29.939	30.098	30.042	29.970	30.351	30.408	30.361	30.480	30.552	30.245	30.315
29.290	29.231	29.167	29.000	29.190	29.008	28.849	28.452	28.459	28.459	28.685	28.653
0.625	0.708	0.931	1.042	0.780	1.343	1.559	1.909	2.021	2.093	1.560	1.662
.70	.70	.74	.72	.79	.81	.73	.79	.75	.77	.79	.79
0.481	0.478	0.384	0.256	0.162	0.128	0.259	0.254	0.244	0.263	0.279	0.271
0.50	0.42	0.41	0.60	0.81	0.83	0.60	0.60	0.57	0.60	0.59	0.57
N 15 E	N 69 W	S 74 W	N 34 W	N 25 W	N 18 W	N 41 W	N 74 W	N 71 W	N 62 W	N 43 W	N 38 W
1.13	1.57	1.53	0.36	3.14	1.66	1.59	2.54	3.03	2.51	1.37	1.17
5.76	6.50	5.69	5.96	8.87	9.36	7.64	7.99	8.31	8.18	6.02	5.08
+1.10	+1.36	+0.34	+0.41	+1.88	+1.56	+1.21	+1.68	+2.19	+2.33	+0.53	—0.33
3.072	3.890	0.735	1.797	3.879	1.657	28.051	33.205	21.505	31.650	27.765	23.550
—0.464	+1.023	—3.396	—0.850	+0.886	+0.019	—2.674	+2.223	—9.329	+0.286	—3.576	—8.076
13	11	8	17	12	11	131	134	99	103	114	109
......	......	......	Inapp.	4.0	10.4	45.4	73.8	65.5	99.0	49.5	53.2
......	......	......	—0.99	+0.68	—3.41	—16.2	+11.1	+ 3.6	+37.4	— 8.9	— 6.1
......	......	......	1	13	18	67	79	69	64	52	52
18	20	22	14	7	7	178	171	198	198	199	204
5	6	8	10	3	2	59	26	35	46	52	57
19	22	23	15	10	8	198	189	212	204	203	233
4	2	1	2	0	0	19	28	25	38	58	34

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—DECEMBER, 1859.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet

Days.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N
					°	°	°	°	°				
1	30.095	30.002	29.830	29.9633	13.6	20.5	32.1	24.20	− 6.58	.072	.110	.142	.110
2	29.631	29.678	.754	.6052	37.1	38.9	30.0	37.13	+ 6.65	.147	.143	.170	.153
3	.746	.764	.856	.7948	31.9	26.6	23.4	26.93	− 3.15	.167	.119	.108	.129
4	.775	.606	.705	.6075	21.2	22.3	22.5	21.67	− 8.22	.115	.103	.093	.097
5	.561	.143	—	—	27.4	41.5			—	.146	.212		
6	.797	.634	.861	.8468	32.1	34.2	27.7	31.03	+ 1.97	.113	.131	.139	.131
7	.679	.442	.876	.6022	33.9	39.7	40.4	37.53	+ 8.67	.143	.135	.170	.161
8	.556	.634	.798	.6852	25.9	23.8	16.2	20.93	− 7.59	.125	.050	.067	.082
9	.969	30.035	30.145	30.0567	19.3	20.5	15.3	16.68	− 11.62	.053	.048	.068	.060
10	30.034	29.744	29.708	29.817	16.0	20.4	33.2	26.55	− 1.30	.070	.100	.160	.114
11	29.764	.840	.966	.8495	28.8	32.1	16.2	25.62	− 2.09	.121	.082	.081	.101
12	30.002	.955	—		21.2	26.0	—		—	.135	.116		—
13	29.604	.416	.526	.4847	38.6	41.5	39.1	40.08	+ 12.93	.215	.241	.239	.236
14	.378	.264	.282	.3075	41.8	43.6	37.1	40.03	+ 13.67	.245	.261	.200	.236
15	.348	.455	.649	.4955	33.9	33.0	28.1	31.58	+ 4.82	.180	.174	.116	.150
16	.720	.707	.725	.7172	24.8	31.5	31.0	29.42	+ 2.75	.120	.142	.126	.134
17	.965	.981	30.008	.9632	10.8	21.8	16.5	19.10	− 7.27	.065	.073	.069	.081
18	30.085	30.115	30.063	30.0904	10.0	12.0	14.4	11.94	− 14.18	.057	.066	.077	.067
19	29.613	29.526	—	—	25.2	34.2			—	.113	.160	—	—
20	.638	.578	29.451	29.5317	33.2	34.0	34.2	33.88	+ 8.00	.166	.142	.168	.158
21	.155	.008	.204	.1380	33.5	32.8	31.3	33.05	+ 7.27	.179	.160	.152	.164
22	.423	.627	.761	.6272	29.2	30.1	21.6	26.23	+ 0.65	.110	.110	.097	.109
23	.514	.445	.578	.5237	27.7	17.6	17.1	19.98	− 5.59	.121	.076	.082	.092
24	.894	30.115	30.250	30.1109	12.0	15.5	6.2	11.27	− 14.22	.069	.076	.047	.061
25	30.319	30.238	—	—	13.0	25.2	—	—	—	.072	.122	—	—
26	29.878	29.666	—		29.1	36.0	—	—	—	.130	.153		—
27	.679	.693	29.797	29.7323	35.7	36.8	35.3	35.25	+ 9.97	.159	.170	.146	.151
28	.550	.816	.764	.8088	33.2	39.5	25.7	29.12	+ 3.97	.166	.117	.088	.123
29	.712	.602	.654	.6505	18.7	19.0	19.1	19.13	− 6.03	.082	.084	.083	.088
30	.643	.567	.463	.5477	22.0	30.3	32.8	28.45	+ 3.27	.110	.164	.172	.147
31	.349	.347	.464	.3947	36.4	37.5	33.8	35.43	+ 10.25	.192	.186	.160	.176
	29.6629	29.6575	29.7180	29.6949	27.12	29.29	26.47	27.40	+ 0.31	.130	.129	.134	.128

Days.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't	ME'N	Rain in Inches.	Snow in Inches.
1	91	76	78	80	N E b N	S E b E	E b S	S 79 E	4.3	12.4	0.6	7.62	9.06	...	...
2	67	60	89	69	S S E	W S W	W S W	S 60 W	4.8	5.8	2.5	3.89	4.42	..	0.5
3	92	82	86	87	W N W	N W b N	N N E	N 9 W	6.8	10.5	0.4	5.61	6.55	..	1.6
4	92	85	77	84	N E b N	N E b E	N E	N 44 E	9.6	15.6	8.4	10.97	11.85		1.2
5	68	80	—	—	E N E	S W b S	W S W	S 62 W	7.2	8.4	18.5	7.09	16.23	0.440	0.1
6	61	.66	92	76	W	W	Calm.	N 29 E	9.6	4.8	0.0	1.03	7.18	..	...
7	74	78	.67	71	E	S E b E	W b S	S 70 W	10.2	4.5	15.0	4.30	9.76	..	...
8	90	39	74	71	W b N	W	W	S 86 W	13.8	22.4	23.4	19.38	19.34		Inap
9	64	61	79	.71	W S W	W b S	W b S	S 77 W	20.6	19.4	13.5	15.08	15.12	......	..
10	77	62	89	76	W b S	S W b S	W b S	S 58 W	3.6	24.6	14.7	14.11	14.80		...
11	76	45	82	.74	W S W	W b N	Calm.	N 20 W	5.2	9.0	0.0	5.07	6.92		...
12	92	.80		—	N E b N	E N E	E b N	N 75 E	10.0	21.8	19.0	18.46	17.02	0.016	Inap
13	92	.93	1.00	95	E	S S W	S W b W	S 6 E	9.5	6.6	1.0	2.71	4.54	0.260	...
14	92	94	90	92	E	S E b S	N W b N	N 21 W	2.8	2.2	10.4	3.00	4.65	0.245	...
15	92	89	75	83	N W b N	N W	Calm	N 33 W	3.8	9.3	0.0	4.08	4.1.	.....	0.2
16	90	79	72	82	N W	W S W	W S W	S 87 W	2.0	15.4	6.8	6.33	8.68		0.5
17	89	62	77	78	N W b N	N	N b E	N 9 E	10.4	2.0	8.0	4.91	5.12	....	Inap
18	82	56	92	80	N E	N E b E	N E b N	N 58 E	7.2	11.8	9.6	8.07	10.27		0.8
19	85	.81			E b S	S E b S	S W b W	S 30 W	4.8	0.2	0.2	2.53	5.87	0.050	...
20	.87	71	85	81	N b W	E b N	E N E	N 59 E	3.8	3.4	12.2	7.67	8.17	0.110	Inap
21	93	85	86	87	N E b E	N b W	N W b W	N 34 W	13.4	13.3	2.0	11.17	13.76	0.080	..
22	72	66	94	76	W N W	W N W	N b W	N 56 W	23.6	23.4	2.0	10.19	14.82	.	Inap
23	90	.79	.80	84	E b S	N E	N E	N 39 E	12.5	10.5	4.4	7.58	8.95	Inap	1.0
24	89	70	80	81	N	N W b N	Calm.	N 20 W	11.6	6.6	0.0	3.05	3.71	.	Inap
25	91	.90	—	—	N b W	Calm.	Calm.	N 80 W	1.6	0.0	0.0	0.31	0.31		..
26	84	73		—	Calm	S E b S	W S W	S 58 W	0.0	1.8	9.5	5.60	6.50	0.057	...
27	76	77	71	73	W b N	W b S	W b N	N 83 W	9.4	5.2	2.4	3.55	3.59	..	Inap
28	87	.72	69	75	W b N	N E b N	N E b E	N 51 E	2.2	2.8	6.2	6.60	7.36		0.2
29	81	.86	81	85	N E b E	N E b E	E N E	N 62 E	14.2	15.4	16.8	17.17	17.28	..	3.0
30	93	.96	91	.93	E N E	E	E b N	N 68 E	20.8	20.6	16.2	15.80	16.91	0.370	2.0
31	89	83	85	83	S b E	S W	W b S	S 54 W	13.6	15.2	10.5	6.62	7.75	0.030	...
	83	.75	.82	81					9.13	10.41	8.17	..	9.36	1.637	10.4

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR DECEMBER.

Highest Barometer........................ 30.351 at 7 a. m., on 25th } Monthly range=
Lowest Barometer .... 29.008 at 2 p. m., on 21st } 1.343 inches

Self-registering Thermom.
- Maximum Temperature............ 45°4 on 14th at p.m. } Monthly range=
- Minimum Temperature.. ... . 4°2 on 25th at a.m. } 41°2
- Mean maximum Temperature .... 33°19 } Mean daily range=
- Mean minimum Temperature ... . 21°37 } 11°82
- Greatest daily range .... 27°3 from p. m. of 1st to a. m. of 2nd.
- Least daily range .. .. 1°8 from a. m. to p. m. of 21st.

Warmest day......... 14th ... Mean temperature......... 40.63 } Difference = 29°36.
Coldest day........... 24th ... Mean temperature ...... 11°27 }

Maximum { Solar...... .... 55°8 on p. m. of 6th } Monthly range=
Radiation. { Terrestrial .... —7°0 on a. m. of 25th } 62°8.

Aurora observed on 2 nights, viz., on 22nd and 24th.

Possible to see Aurora on 8 nights; impossible on 23 nights.

Snowing on 18 days,—depth 10.4 inches; duration of fall 74.4 hours

Raining on 11 days,—depth 1.667 inches; duration of fall 44.0 hours.

Mean of cloudiness = 0.83.

Most cloudy hour observed, 2 p. m., mean = 0.87; least cloudy hour observed 10 p. m., mean, = 0.79.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
2162.31	1909.04	2586.33	2962.27

Resultant direction N. 18° W.; Resultant Velocity 1.66 miles per hour.

Mean velocity.... . ... 9.36 miles per hour.
Maximum velocity .... 30.0 miles from 9 to 10 a. m. on 22nd.
Most windy day......................... 8th .Mean velocity 19.64 miles per hour.
Least windy day .. .. 25th...Mean velocity 0.31 ditto.
Most windy hour .... 10 to 11 a. m . Mean velocity 11.09 ditto. } Difference
Least windy hour .... 9 to 10 p. m...Mean velocity 7.52 ditto. } 3.57 miles.

4th—Slight showers of Snow and Hail most of the day.
9th—A considerable number of Meteors observed from 9 to 11 p. m.
9th—Corona round the Moon from 5 p. m.
13th—Very mild day. Dense Fog, commencing at noon.
13th—Dense Fog, continuing till 6 p. m. Very mild day.
14th—Perfect Halo round the Moon, 6 to 8 p. m.
17th—Corona round the moon at 10 p. m.
24th—Toronto Bay frozen over during the night.
25th—Several skaters crossed the Bay to the Island during the course of the day.
29th—Very stormy day, Snowing and drifting heavily.
30th—Very stormy day, Rain, Sleet and Snow with little intermission all day.

The Resultant Direction and Velocity of the Wind for the month of December from 1848 to 1858 inclusive, were respectively N 73° W and 1.55 miles.

December, 1858, was mild and cloudy; the amount of Rain received was about the average, but the depth of snow was 3.4 inches less than the mean of 15 years.

COMPARATIVE TABLE FOR DECEMBER.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Diff. from Aver	Max ob'd	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y	Mean Force or Velocity.
	°	°	°	°	°							
1840	24.3	2.1	41.0	—4.4	45.4	3	inapp.	18	...	...	...	....
1841	23.7	+2.3	45.5	+2.4	43.1	7	6.000	5	...	...	..	1.33 lbs.
1842	24.7	—1.7	40.3	+3.6	36.5	3	0.880	17	...	..	...	0.61
1843	30.0	+3.6	41.1	+2.7	38.4	6	1.040	8	8.1	..	.	0.53
1844	28.2	+1.8	48.9	—0.8	49.7	6	impft	6	4.2	...	...	0.40
1845	21.1	—5.3	37.6	—2.7	40.3	2	inapp.	12	4.7	...	..	0.70
1846	27.3	+1.1	49.2	+3.7	45.5	5	1.215	9	6.0		...	0.57
1847	30.1	+3.7	50.0	+6.6	43.4	7	1.185	8	6.8	...	.	0.35
1848	29.1	+2.7	49.1	+0.6	48.5	7	2.750	7	16.5	S 83° W	1.12	5.44 mls.
1849	26.5	+0.1	41.8	—5.2	46.5	5	0.840	12	0.6	N 82° W	2.56	6.23
1850	21.7	—4.7	49.8	—0.7	58.0	2	0.190	18	29.5	N 44° W	2.03	7.40
1851	21.5	—4.9	43.8	—14.5	54.3	6	1.075	15	10.7	N 82° W	4.00	7.87
1852	31.9	+5.5	51.0	+18.0	37.1	7	3.995	10	20.1	S 60° W	1.03	6.54
1853	25.3	1.1	42.2	—5.2	47.4	4	0.625	13	22.3	N 35° W	2.39	4.98
1854	21.9	4.5	41.8	—5.9	47.7	5	0.590	12	17.2	N 47° W	4.18	8.68
1855	26.8	+0.4	45.9	—2.1	48.0	6	1.845	10	29.5	S 85° W	3.29	11.38
1856	22.9	—3.5	41.2	9.1	50.3	6	1.79	20	10.3	S 87° W	4.02	11.56
1857	31.9	+5.5	45.6	+6.7	39.0	7	8.205	14	9.0	N 80° W	2.51	6.84
1858	27.4	+1.0	43.6	+6.0	38.6	11	1.667	18	10.4	N 18° W	1.66	9.36
M	26.30		44.60	0.59	45.19	5.5	1.638	12.2	13.81		...	7.80 Mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JANUARY, 18[illegible].

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result.	M'N	Rain in Inches.	Snow in Inches.
1	29 589	29.290	29 637	29 6638	32 5	36 0	27 0	31 52	+ 6 36	164	170	129	153	88	.80	88	85	s b w	w	n w b n	n 69 w	6 2	11 5	3 8	6 37	6 49	.	inap.
2	.982	.940	—	—	26 7	26 7	—	—	—	140	125			96	86	—		Calm.	n e b n	n e	n 63 e	0 0	6 8	4 5	5 78	6 32	..	inap.
3	.912	767	.690	7802	31 4	34 8	35 3	33 73	+ 5 59	162	146	150	160	91	.72	73	78	n e n	s b n	s b n	s 23 e	9 2	6 2	10 2	7 54	8 20	.	0 1
4	.606	.616	674	6390	33 5	34.7	31 2	32 63	+ 7 30	186	117	145	160	.97	58	62	81	Calm.	w b n	w b s	s 83 w	0 0	10 0	11 5	8 90	9 27	..	0 2
5	.585	488	600	5706	29 9	40 1	33 7	34 47	+ 9 33	161	143	167	153	97	57	86	79	s w b s	w s w	w s w	s 62 w	12 2	9 8	4 0	7 70	7 88		...
6	.756	.790	450	6937	29 7	30 3	29 9	29 83	+ 4 70	148	141	153	148	89	85	95	90	w	n w bw	n n e	n 52 e	5 2	1 8	13 6	2 96	5 50		2.0
7	.230	29 974	301	.1755	33 3	27 4	14 6	24 00	1 14	179	138	061	122	96	93	76	88	n	n b w	n w bw	n 53 w	0 8	11 6	14 8	14 06	15 21	inap.	2 9
8	.504	29 674	.603	5700	5 3	7 1	6 4	6 13	− 19 00	053	042	050	043	92	84	.85	77	n w	n w b w	n w bw	n 60 w	17 3	6 2	13 2	8 48	11 40	...	0.5
9	722	684	—	-	9 4	10.9	—	—	-	022	021	-	-	79	78	—	—	n	n	n b n	n 4 e	12 4	9 8	5 0	7 66	7 79		0 3
10	30 236	30 236	30 035	30 1733	− 10.5	−6 2	4 4	−0.40	33 70	006	032	039	024	59	90	.73	.79	n b n	n b e	s e	n 83 e	9 4	1 0	5 4	3 67	7 00	..	0.5
11	29 757	29 584	29 646	29 6647	13 3	14.2	14 4	14 45	—10 60	070	063	076	072	90	76	91	85	n e n	n e b s	s e b n	s 50 e	7 4	9 0	3 2	6 66	6 12	.	4 5
12	600	.537	515	5427	15 8	19 4	22 7	19 67	— 5 42	072	080	117	083	80	76	96	86	n e b n	n e	n e b n	n 51 e	6 5	4 8	2 4	3 43	5 24	inap	0.1
13	496	580	573	5596	25 6	36 5	34 1	33 16	+ 8 07	131	191	178	171	95	58	90	90	s w bw	s w bw	Calm	s 42 w	10 2	0 2	0 0	2 12	2 18		...
14	.486	238	066	2332	34 2	35.8	34 6	34 95	+ 9 85	185	207	188	192	93	98	95	95	s e n	n n e	n e b n	n 69 e	5 2	11 0	10 5	7 57	8 78	0 658	.
15	29 943	29 998	.333	1068	35 3	32 1	27 7	31 14	+ 6 03	199	134	135	153	.90	76	69	86	s w b s	n w	w n w	n 68 w	7 4	23 4	19 2	14 41	16 29	0 017	0 4
16	29 540	29.523	—	—	24 3	31 0		—	—	130	145		—	91	69	—		w	s w	s b w	s 45 w	17 0	6 5	8 5	5 67	8 31	...	2.3
17	611	773	30 034	8067	31 4	34 1	8 6	20 47	— 4 55	165	143	055	108	93	79	86	86	w b s	n w b n	n w b n	n 24 w	6 4	14 5	0 5	6 14	6 34	.	0.1
18	30 136	30 043	29 831	9933	3 2	19 1	27 0	17 17	7 80	048	094	107	093	93	81	73	86	n w b n	s w bw	s w	s 50 w	3 0	10 8	13 6	6 72	9 40	...	inap.
19	29 533	29 728	673	7472	25 9	33 7	36 0	32 67	+ 7 78	128	145	180	158	91	69	93	87	s w b w	s s w	s w b s	s 21 w	6 2	12 5	7 5	3 56	5 63		..
20	607	433	.394	4780	32 3	41 5	34 9	37 98	+ 13 13	171	162	228	194	91	68	96	84	s s w	s w b s	s w b s	s 39 w	3 5	16 0	3 0	7 32	7 90	0 185	..
21	468	439	578	5080	34 8	36 0	25 0	31 95	+ 7 17	203	148	092	135	93	64	68	75	w b s	w s w	n w bw	n 64 w	8 3	10 6	12 2	6 30	9 39		0 3
22	636	856	30 063	8813	16 2	14 0	10 0	13 02	− 11 75	067	044	048	060	93	53	69	72	n n e	n w b n	w s w	n 70 w	5 0	12 2	13 5	8 76	12 01	..	0 2
23	30 112	30 101		—	11 1	15 8	—	—	—	060	061			83	66	—	-	s w	w s w	s w	s 52 w	12 2	12 6	19 0	13 88	14 17	...	...
24	30 042	29 957	29 937	9766	22 7	29 9	31 9	28 23	+ 3 67	110	090	137	111	90	55	73	71	s w b s	s s w	s s w	s 30 w	16 3	19 5	14 5	13 06	15 13	...	...
25	29 890	820	842	8578	25 8	36 4	34 2	32 72	+ 8 13	144	124	125	135	90	56	63	74	s w bw	s s w	s w bw	s 40 w	5 5	10 5	11 6	8 81	9 09	...	...
26	954	.944	30 026	9967	31 7	36 0	29 9	32 18	+ 7 70	147	147	124	134	82	69	74	73	s w bw	s s w	s w	s 42 e	6 0	14 5	3 0	6 51	8 04	...	...
27	30 084	.879	29 573	8063	26 6	30 6	32 8	30 33	+ 5 90	119	149	171	145	82	.87	91	86	n b e	e b n	e b n	n 77 e	6 5	19 0	15 0	15 69	15 92	0.095	5.0
28	29 385	466	650	.5012	37 5	38 9	33 5	36 37	+ 12 07	221	152	122	164	98	65	63	75	s b n	w b s	w s w	s 63 w	5 6	15 0	5 8	6 94	7 67	..	...
29	686	.670	.884	.7287	29 2	32 6	29 5	30 20	+ 6 90	147	124	114	125	90	66	69	.74	s w bw	w b s	w	n 87 w	5 6	10 2	13 0	9 05	9 78		...
30	963	.988	—	—	20.9	26 5	—	—	—	079	083	—	—	70	52	—	—	Calm.	w s w	w	s 63 w	0 0	10 2	6 2	6 10	6 20		0.1
31	30.033	.987	986	9940	22 0	30 6	28.1	27.30	+ 3 22	104	093	123	106	87	64	.60	72	Calm.	s w	w s w	s 43 w	0 0	8 0	2 2	4 21	4 32	...	...
M	29 8900	29.8320	29 8336	29 6770	24 54	29 73	28.20	26.44	+ 1.64	.138	.122	.134	.130	.89	.72	.81	.81					6 88	10 51	9 90		8.76	1 440	14 6

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JANUARY, 1859.

Highest Barometer . . . . 30.311 at 11 a.m. on 10th, } Monthly range=
Lowest Barometer . . . . 28.934 at 8 a.m. on 15th, } 1.377 inches.

Self-register-ing Ther.
- Maximum temperature . . . . 43°2 on p.m. of 20th } Monthly range=
- Minimum temperature . . . . —26°5 on a. m. of 10th } 69°7
- Mean maximum temperature . . 30°46 } Mean daily range = 11°91.
- Mean minimum temperature . . 18°55 }
- Greatest daily range . . . . . . 39°8 from 6 a.m. of 10th to 6 a.m. of 11th.
- Least daily range . . . . 2.8 from 20th to 21st.

Warmest day . 20th ... Mean Temperature . . . 37°08 } Difference=46°83.
Coldest day . 10th ... Mean Temperature . . . 6°85 }

Maximum { Solar . . . . 56°0 on p. m. of 20th } Monthly range=
Radiation { Terrestrial . . . . . . —38.2 on a. m. of 10th } 94°2.

Aurora observed on .... , viz.: .... ; possible to see Aurora on 13 nights; impossible on 18 nights.

Snowing on 19 days; depth, 13.4 inches duration of fall 85.9 hours.

Raining on 6 days depth, 1.449 inches; duration of fall, 39.5 hours.

Mean of cloudiness=0.72; most cloudy hour observed, 4 p. m., mean=0.86: least cloudy hour observed, midnight, mean=0.59.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1729.89	2105.98	1148.10	3477.55

Resultant direction, S 81° W; Resultant Velocity, 3.17 miles per hour.
Mean velocity of the wind 8.76 miles per hour.
Maximum velocity . . . 27.2 miles per hour, from 3 to 4 p.m. on 22nd.
Most windy day . . . . 15th—Mean velocity, 16.26 miles per hour.
Least windy day . . . . 18th Mean velocity, 2.18 do
Most windy hour, 1 to 2 p. m.– Mean velocity, 11.11 do } Difference
Least windy hour, 7 to 8 a. m.—Mean velocity, 6.17 do } 4.94 miles.

5th. Halo round the sun from 9 to 11 a. m.
6th. Halo round the sun from 10 a. m
7th. Foggy and mild during the forenoon.
9th. Very cold day; wind remarkably keen.
10th. Extremely cold morning, the temperature at 6 a. m. (—26°5) was the lowest yet recorded at this Observatory.
13th. Foggy and mild at 10 p. m. and midnight.
14th. Dense fog all day.
18th. Corona round the moon from 11 p. m.
20th. Foggy and very mild at 10 p. m. and midnight.
23th. Solar Halo and faint Parhelion at 4 p. m.
26th. Very dense Fog from 7 to 10 a. m.
31st. Halo round the sun from noon to 1.30 p. m.

The Resultant Direction and Velocity of the Wind for the month of January, from 1848 to 1859 inclusive, were respectively N 74° W, and 2.74 miles.

The month of January, 1859, was Foggy, Mild and Cloudy; the Mean Temperature was 2°78 above the average of the last 20 years, and the monthly range (69°7) was the greatest yet recorded.

COMPARATIVE TABLE FOR JANUARY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant. Direction.	Resultant. Velocity.	Mean Velocity
1840	17.0	— 6.7	40 6	—13 8	54 4	4	1 395	11	...	...	...	...
1841	26.6	+ 1.9	41.7	— 4.1	46 8	2	2.150	14	...	...	...	0.38lbs
1842	27 9	+ 4.2	45.8	1.8	44.5	5	2.170	9	...	...	...	0.78 "
1843	28.7	+ 5 0	54 4	1.6	52 9	6	4 295	12	14.2	...	...	0 69 "
1844	20 2	— 3 5	44.6	— 7 7	52 3	7	3 005	11	24.9	...	...	0.70 "
1845	26 5	+ 2.8	43 0	— 3 4	46 4	5	Imp't	9	22.7	...	...	0.70 "
1846	26 7	+ 3.0	41.2	0 3	40 9	5	2 335	10	6 0	...	...	0.55 "
1847	23.3	— 0.4	42 6	— 2 2	44 8	7	2.135	5	7.5	...	...	1 09 "
1848	28.7	+ 5.0	51 5	—12 0	63 5	7	2.245	8	7.1	N 82 W	2.09	5.82ms.
1849	18 5	— 5 2	40 1	—15.2	55.3	4	1 175	10	9 2	N 63 W	3 06	6 71 "
1850	29.7	+ 6.0	46.3	10.6	35 7	5	1.250	8	5.2	N 37 W	0 65	5 80 "
1851	25.5	+ 1.8	43.2	—12 8	56 0	4	1.275	10	7 8	S 77 W	3 26	7 69 "
1852	18 4	— 5.3	37.3	— 7 0	44 3	0	0 000	19	30.9	N 68 W	3.14	7.67 "
1853	23.0	— 0 7	40.9	— 6 6	47 5	1	0 290	6	7 5	N 27 W	2.52	6 34 "
1854	23 6	0.1	45.2	— 4 3	49 5	7	1 270	11	7.5	N 77 W	2 44	6 58 "
1855	25 9	+ 2 2	48 2	— 4.7	52.9	5	0 525	13	23.3	N 80 W	1 86	7 67 "
1856	16 0	— 7 7	33 1	—12 1	45 2	0	0 000	14	13 6	N 75 W	5 24	10.69 "
1857	12 8	—10.9	34 6	20 1	54.7	3	Inapp	16	21.8	N 70 W	4 96	10 31 "
1858	30 0	+ 6 3	45 8	7 3	38 3	6	1 152	11	4.0	N 71 W	2 33	7 40 "
1859	26.4	+ 2.7	41 5	—26.5	68 0	6	1.449	19	16 4	S 81 W	3.17	8.76 "
Mean	23.72	...	43.08	—6.56	49.64	4 4	1.460	11.5	13.51	...	...	7.64

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—OCTOBER, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude 73 deg. 36 min. West Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	Tension of Vapor 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour 6 A.M.	2 P.M.	10 P.M.	Mean direction of Wind	Rain in Inches	Snow in Inches	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	29 607	29 612	29 700	43 6	62 7	45 9	209	422	22.	75	76	72	N E b E	N E b E	N W b N	0 00	0 52	5 70	...	..		C. Str. 9.	C. St. 10.	C. St. 4.
2	.815	734	779	38.0	57.2	41 8	177	216	200	85	46	78	N W	W S W	S W b S	9 46	11 43	3 06	...		..	Clear.	Clear.	Clear.
3	.519	453	.314	41 2	56 0	48.2	212	363	310	62	61	02	S S E	S E	S E	1 73	2 30	0 22	...	0 200	.	C. St. 10.	Do.	C. St. Th. & L.
4	419	.461	597	50 0	57 9	50 4	290	288	283	82	61	7.	W S W	W	W	12 51	22 82	11 06		..		Do. 6.	C. Str. 9.	St. 4.
5	.694	806	947	44 9	56 8	38 3	218	179	186	76	40	81	W S W	W	W b N	6.63	18 41	9.10	..		..	Clear.	Clear.	Clear.
6	.998	914	901	36.6	57 2	41 0	191	211	197	90	46	78	W S W	W S W	W S W	3 57	7 81	2 15	.		.	Do.	Do.	Do.
7	619	.322	361	30 2	45 5	45 0	149	275	282	90	92	90	E N E	N E b E	S	0 00	3 08	3 40	...	0 770		St. 8.	Rain.	Rain.
8	.211	.219	270	37 2	44 6	40 4	178	218	182	81	76	73	S W b W	W S W	S W b S	10 90	14 67	4 40		0 178	.	Rain.	Cir. Str. 6.	C. St. 6.
9	247	.371	026	30 0	45 1	43 7	283	204	224	96	68	70	S W b W	W b N	W	8 71	27 43	2 85	..	0 400		Do.	Do. 10.	Do. 6.
10	619	.879	30 005	40 2	53 2	42 1	183	219	222	73	54	83	W	W	W S W	11 05	13 32	1 80	...	..		C. Str. 2.	Do. 4.	Clear. Au. B.
11	30.014	30 099	.118	34 0	57 2	39.6	175	316	188	89	.67	77	N W	S W	N E b E	0 21	1 11	2 90	.	..		C. C. St. 6.	Clear.	C. St. 10.
12	010	000	29 990	31 1	55 8	45 7	110	230	280	94	53	92	E N E	E N E	S E b E	4 47	4 23	1 75	...	..	...	Clear.	C. C. St. 4.	Do. 6 Au. Bor.
13	29 903	29 800	699	49 7	40 7	57 0	237	322	430	97	92	94	S E	S E b E	S S E	0.00	11 95	6 77	..	1 040		Rain.	Rain.	Do. 10.
14	616	573	713	49 0	54 5	46 2	329	243	262	95	58	84	W S W	S W b S	S S W	7 80	9 50	0 73	...	0.103	.	C. St. 10.	Cir. Str. 8.	Clear.
15	758	909	30 015	42 4	51 7	42 5	244	269	237	91	69	87	W b S	W	W	3 97	2 32	14 26		..		Cir. C 6.	Do. 6.	C Str. 4.
16	30 252	30 254	.276	30 5	51 4	43 0	142	245	236	84	65	.9	S W b W	S b W	S E	2 27	0 49	0 00	..	...		Clo.	C. C Str. 8.	Do. 6.
17	.238	.198	.204	40 2	49 6	44 2	210	297	256	86	85	89	N E b E	N E b E	N N E	2 27	5 71	5 31	..	0 110	.	C St. 7.	Cir Str 6.	C C. St. 6.
18	243	063	050	35 8	70 0	56 0	107	482	398	93	66	90	S	S W	S S W	0 11	0 73	4 22	..	..		Fog.	Do. 4.	Clear Au. B.
19	004	.010	017	47 1	64 0	60 2	208	373	435	92	62	85	S S E	S S E	W S W	1 42	1 10	2 32	.	..	.	Clear.	Clear.	C. C 4.
20	098	100	116	52 0	63 0	41 1	328	250	216	84	62	87	W S W	E S E	E S E	0 12	3 71	6 45	..		..	C. Str. 2.	C. St 6.	Clear.
21	.242	.124	080	35 0	56 0	43 1	160	288	231	84	65	83	N E	E N E	E N E	5 75	9 86	5 40	.		..	Clear.	Clear.	Do.
22	004	29 910	29 898	43 7	59 0	51 0	205	242	348	92	46	95	E b S	S E	W	0 13	3 81	0 05	...	Inp.	.	C St. 10.	C. St. 6	C. Str. 10.
23	29.852	805	910	43 7	54 0	48 2	244	355	310	91	84	92	N b E	N b E	N b E	0 33	0 63	10 00	..	Inp.	.	Do. 6.	Do. 10.	Rain.
24	952	.987	30 121	41.0	45 0	37 0	241	.198	178	95	65	81	N E b E	N E b E	N E b E	23 33	19 00	7.12		4 530	..	Rain.	Do. 4.	Clear.
25	30.204	30 200	242	30 0	43.0	31 0	136	127	161	83	47	95	S E b E	E N E	N E b E	0 92	8 32	2 67	..		..	Clear.	C. St. 2.	Do.
26	.234	314	197	24 2	53.2	36 0	111	269	170	86	67	80	N E	S W b S	S W b S	0 40	1 22	0 00	...	..		St. 2.	St. 4.	Do.
27	159	.164	.146	29 0	59 1	41.5	147	323	235	94	65	91	W	W	W	0 14	0 51	0 11	..	...	...	Clear.	Clear.	Do. Au. B.
28	.167	.210	283	32 0	53 0	34 3	168	116	102	95	43	84	W b S	N E b E	E S E	0 00	4 09	0 73	..	...	...	Light Cirr.	Do.	Do. Do.
29	.231	.001	29 904	28 0	43 0	44 7	147	237	280	94	87	90	N E b E	E N E	S E b S	7 90	8 00	4 03	...	0 200	...	St. 4.	C. St. 6.	C. St. 10.
30	29.810	29.712	.738	40.6	68 9	49 6	241	.350	.329	95	53	90	S S E	S E b S	N E	4 40	5 01	0 13	...	0.103	...	C. St. 8.	Do. 8.	Do. 8.
31	.770	.690	.953	47 9	58 1	47 0	.310	282	.282	.94	.68	78	S W	W b S	N E b E	0 78	5.86	1.52	...	...	...	Do. 10.	C. C. St. 6.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—NOVEMBER, 1858.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M.D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29 963	30 126	30 250	44 1	46 8	38 1	262	182	157	96	61	71	NE b E	NE b E	N N E	5 30	6 52	6 81	...	Inp.		Slight Rain	C. St. 2.	Str. 2.
2	30 305	254	201	30 0	43 1	34 0	137	171	155	74	62	.79	NE b E	NE b E	NE b E	3 25	8.27	6.50	...	..	.	Clear.	Light Cir. 2.	Clear.
3	231	.114	29 928	29.9	40 1	38 0	142	139	180	88	56	81	NE b E	NE b E	NE b E	3 27	5 61	1.55	...	..		Do.	Cir. St 4.	C. St. 6.
4	29.871	29.954	.932	30 4	36.1	35 2	206	191	183	95	90	90	NE b E	E S E	NE b E	9 00	1 19	2 63	...	0 541	Inp.	C St. 10.	Sleet & Sw.	Rain.
5	.900	.852	883	34 0	44 0	41.0	162	248	219	.84	88	87	NE b E	W b N	N N W	0 47	2 00	0 22	...	...	...	Do. 6.	Cir St. 10.	C. St. 10.
6	.848	.828	681	36 0	41 0	36 8	.191	190	170	90	.74	80	N N E	NE b E	NE b E	2 30	8 76	12 20	...	Ip.		Do. 9.	Do. 9.	Do. 10.
7	.570	520	.600	35 6	35 0	32 7	175	.183	173	94	90	94	N E b E	NE b E	N N W	18 13	7.37	1.00	...	2 550	0 40	Sleet & Rn.	Rain	Snow.
8	.550	497	720	32 5	40 5	29 0	178	146	174	94	60	94	W S W	W	W N W	0 00	1 40	5 40	...	Inp		C St. 10.	C. St. 10.	St. 4.
9	746	761	770	33 0	38.0	31 0	175	195	155	94	82	80	N b W	S	S	1 83	0 00	0 00	...	...	...	Do. 9.	Do 8.	Do. 10.
10	.761	.749	.924	26 3	31 7	24 5	128	124	111	87	73	86	N N E	W N W	W N W	2 26	6 79	9 90	...	...	0 40	Snow.	Do. 9.	C. St. 9.
11	30 004	30 002	30 007	20 8	25.0	26 1	.085	108	094	78	80	68	W N W	W s W	S W	17 62	5 53	1 15	..			C. St. 8.	Do. 10.	Do. 10.
12	29 970	29 899	29 927	19 1	32 2	25 0	077	137	117	76	74	.87	N b E	S E	S E	0 02	6 02	1.22	...	...	.	Do. 8.	Do. 4.	Cir. St. 2.
13	871	530	520	26.1	30 7	30 0	128	142	.148	87	86	89	E N E	E S E	E	1 73	7 17	2.10	...	...	2 55	Do. 10.	Snow.	Snow.
14	792	.770	52.	13 3	31 7	10 0	057	149	076	72	84	83	W	W b N	N W	23 65	14 00	8 62	...	...	0 7.	Clear.	C. St. 4.	Clear.
15	.792	.700	691	6 0	25 0	18 6	043	100	077	75	74	76	W S W	W	W b N	1 04	1 19	3 70	...	.	...	C. St. 10.	Do 8.	Do.
16	.449	.450	512	16 0	26 7	25 1	074	117	117	82	80	86	W	N E	N N E	12 83	16 00	15 44	...	...	Inp	Do. 8.	Snow.	C St 10.
17	617	597	.714	23 1	30 9	29 0	106	143	128	86	84	77	N W	W	W	29 75	25.02	12 20	...	...		Do. 8.	Cir. St. 6.	Clear.
18	.694	.519	.670	31 5	38 1	36.0	149	165	191	84	73	90	W S W	W S W	W S W	7 01	11 13	8 33	...	...	.	Do. 10.	Do. 6.	C St. 8.
19	.677	736	852	26 6	21 4	18 9	117	058	.071	82	50	70	NE b N	W N W	W	19 90	22 22	14 23	...	...	Inp.	Do. 8.	Do 10.	Cir St. 8.
20	.832	747	801	19 2	36 4	27 3	077	107	128	71	90	82	W	W S W	W S W	9 35	3 00	8 42	..	.		Do. 6.	Do. 6.	C. St. 6.
21	757	.761	782	22 4	37 4	28 2	095	193	123	70	80	87	S E	S E	NE b E	0 01	0 00	0 35	...	...	.	Cirr 2.	Clear.	Cir. St. 2.
22	.893	.890	98.	19 1	35 2	28.6	.072	162	135	75	80	88	N b E	E	E N E	0 07	0 12	1 33	...	...		C St 10.	C. St 10.	C St. 9.
23	.681	.678	582	20 1	27 0	26 2	081	129	135	79	88	93	NE b E	NE b E	NE b E	3 75	18 63	9.61	...	...	0 90	Do. 10.	Snow.	Snow.
24	867	.550	627	27 2	34 0	22 3	120	155	095	88	79	70	NE b E	N	W b N	24 81	7 63	0 42	...	...	0 56	C St. 10.	C St 4.	C St 2.
25	.681	.640	716	19 1	29.0	28 1	087	129	128	84	82	82	W	W N W	W S W	11 10	10 90	10 50	..	...	...	Do. 10.	Do, 10.	Do. 10.
26	.761	.800	.914	26 0	28 0	20 7	128	117	117	87	76	82	W	W N W	W N W	7 77	9 48	9 65	...	..		Do 10.	Do. 9.	Do. 10.
27	.952	.910	942	25 1	30 0	28 2	111	130	129	90	78	84	W N W	S W	S W	10 83	2 45	2 70	...	...	.	Do. 9.	Do. 9.	Do. 10.
28	870	.681	687	20 4	29 2	21 0	085	123	085	78	77	78	W	S S W	S E b E	5 92	0 08	0 01	...	..	..	Do. 9.	C. C. St. 8.	Do. 6.
29	.644	.660	.677	18 1	26 2	20 9	.081	111	085	83	80	78	NE b E	S E	S b W	1 11	1.77	0 00	...	...	..	Do. 8.	C. St. 10.	Do. 8.
30	.494	.475	.914	18.7	29 0	12 6	077	128	054	76	.77	71	S E b S	W	W N W	1 20	5.96	10.18	...	..	1 10	Do. 10.	Snow.	Clear.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR OCTOBER.

Barometer	Highest, the 18th day	30.276
	Lowest, the 8th day	29.211
	Monthly Mean	29.982
	Monthly Range	1.065
Thermometer	Highest, the 18th day	70°6
	Lowest, the 26th day	24°2
	Monthly Mean	46°48
	Monthly Range	46°4

Greatest Intensity of the Sun's Rays .... 81°4
Lowest point of Terrestrial Radiation .... 24°0
Amount of Evaporation in inches 1.67
Mean of Humidity .... .792
Rain fell on 12 days, amounting to 5.629 inches; it was raining 53 hours 10 minutes and was accompanied by thunder and lightning on 1 day.
The most prevalent wind the N.E. by E.
The least prevalent wind was S.
The most windy day was the 24th; mean miles per hour, 16.48.
The least windy day was the 1st; mean miles per hour, 2.00.
Aurora Borealis visible on five nights.
The electrical state of the atmosphere has indicated moderate intensity.
Ozone was present in large quantity.
Snow Birds, *Plectrophanes nivalis*, first seen on the 26th day.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR NOVEMBER.

Barometer	Highest, the 2nd day	30.305
	Lowest, the 16th day	29.449
	Monthly Mean	29.779
	Monthly Range	0.856
Thermometer	Highest, the 1st day	46°.2
	Lowest, the 15th day	4°.8
	Monthly Mean	26°78
	Monthly Range	41°4

Greatest intensity of the Sun's Rays .... 58°.9
Lowest point of Terrestrial Radiation 4.8
Mean of Humidity .... .899
Rain fell on 6 days amounting to 3.090 inches; it was raining 31 hours 9 minutes.
Snow fell on 10 days amounting to 6.41 inches; it was snowing 46 hours 35 minutes.
The most prevalent wind was N. E. b E.
The least prevalent wind E.
The most windy day the 17th; mean miles per hour 22.49.
Least windy day the 21st; mean miles per hour 0.11.
Lunar Halo visible on 1 night.
First Snow fell on the 4th day.
The electrical state of the Atmosphere has indicated moderate intensity.
Ozone was present in large quantity.

THE CANADIAN JOURNAL.

NEW SERIES.

No. XXI.—MAY, 1859.

NOTES ON LATIN INSCRIPTIONS FOUND IN BRITAIN.

PART III.

BY THE REV. JOHN McCAUL, LL.D.,
PRESIDENT OF UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, 26*th March,* 1859.

8. The following inscription is on a sarcophagus, or stone coffin, which was found at York several years ago and is now preserved in the Museum of the Yorkshire Philosophical Society:

MEI....AL· THEODORI
ANI..OMEN· VIXIT· ANN
XXX.V· M.VI· EMI· THEO
DO.A· MATER· E· C·

In removing it when found, it was unfortunately broken, and the inscription is consequently imperfect. The fracture extends between I and A in the first line, I and O in the second, X and V in the third, and O and A in the fourth.

Mr. Wellbeloved (*Eburacum*, p. 110,) remarks:

"The difficulty is confined to two words. The first word no doubt, when perfect, was MEMORIAL for MEMORIALE, but the author has not met with that

word in any other inscription. If L, which is undoubtedly the present reading, be an error for E, the difficulty is removed. EMI in the third line presents the next difficulty; it might, though unusual, be a contraction for EMERITI; but that would be very strangely introduced, after the mention of the age, and without any notice of the legion to which Theodorianus had belonged. OMEN was most probably NOMEN, and that the abridged form of NOMENTANI."

Dr. Thurnham (*Crania Britannica, Decade* 1.) observes:

"The principal difficulty is confined to two words; the first of the inscription, and the EMI in the third line. It seems most probable that both these are *prænomina*, the first that of Theodorianus, the other of Theodora; though what these names have been it is perhaps not possible to say." * * * The inscription is probably to be thus read: Diis Manibus [conjectured to have been on the *operculum* or lid, which has not been preserved] Mei...al. Theodoriani Nomentani vixit annis xxxiv, mensibus vi. Emi. Theodora mater efficiendum curavit." * * * "Altogether the external evidence is in favour of the remains found in this coffin being those of a Roman citizen and soldier, a native of Italy, and of the ancient Latin territory in the immediate neighbourhood of Rome itself."

There is no doubt that the only difficulties in the inscription are from M to L in the first line, and EMI in the third. Mr. Wellbeloved's conjecture of NOMENT· is confirmed, as far as the last letter is concerned, by "an accurate rubbing," procured by Dr. Thurnham, "which shows distinctly the ligulate letter T in the word OMENT." It also seems to me evident that Mr. Wellbeloved's readings, MEMORIAL· and EMERITI, must be at once rejected, and for the reasons which he himself states. Nor can I concur with Dr. Thurnham in the view which he has taken of the external evidence being in favour of the remains being those of a Roman citizen and soldier. The absence of the usual notice of the legion or cohort seems to suggest the presumption, that Theodorianus had not been a soldier.

I am inclined to read from M to L thus: MEM· C· VAL·, *i. e.* Memoria Caii Valerii. MEM may stand for either MEMORIA or MEMORIÆ; if for the former, I regard it as meaning "The monument;" if for the latter, "To the memory." I prefer the first interpretation, which is confirmed by the words MEMORIAM· POSSVIT (*sic*) on another stone coffin also found at York. The abbreviation MEM· may be justified by the inscription given by Gruter, 894, 2, and the construction in the nominative by that given by Morcelli, cc.

As to EMI, I regard it as the perfect tense of the verb *emo,* i. e. as meaning, "I Theodora his mother bought." It is scarcely necessary to

point out to any one familiar with Latin sepulchral epigraphy the frequency of such a notice of the mode in which the sepulchre was obtained. Fabretti, p. 153, gives many examples of such purchases. Nor is the use of the first person rare. *Vide* Fabretti, pp. 236 and 252. The only doubt which remains is as to the meaning of E· C. Various interpretations may be proposed, such as *ei carissimo, ejus carissima, ejus causa, ex communi*, scil. sumptu, or according to the received interpretation of these *notæ* on other stones, *erigendam* (i. e. memoriam) *curavi*, for such sarcophagi stood above ground.

According to my views, the whole inscription may be read thus:—Memoria Caii Valerii Theodoriani Nomento. Vixit annos (or annis) xxxiv, menses (or mensibus) vi. Emi Theodora mater [et] erigendam curavi.

I have no grounds for the selection of *Caii* as the prænomen; it is wholly conjectural. If there had been room for the *Nomen gentilicium* and the *Nomen patris*, I should have supplied G or P before AL, thus taking it for either GAL· or PAL·, the abbreviations of the Galerian or Palatine tribes. After *emi* I understand *locum* as is usual, (or *memoriam*,) and supply *et*, the omission of which is not rare.

9. In the year 1726 an altar was found at Corbridge, in Northumberland, which bore the following inscription, as given in the Appendix to Gordon's *Iter Septentrionale*, and in Horsley's *Britannia Romana*, Northumberland, n. cviii.:

LEG· A.........
Q· CALPVRNIVS
CONCESSINI
VS· PRAEF· EQ
CAESA· CORI
ONOTOTAR
VM· MANV PR
AESENTISSIMI
NVMINIS DEI VS.

The altar and inscription are imperfect, as a portion of the stone has been broken off at the top. Horsley supplies the deficiency in the first line with VG· PR· PR·, and reads the whole thus:—"Legato Augustali proprætore, Quintus Calpurnius Concessinius Praefectus

equitum Cæsariensium Corionototarum manu præsentissimi numinis dei votum solvit."

The chief difficulty in the inscription is in the words CAESA· CORIONOTOTARVM. The author of the letter in Gordon's Appendix thinks that we have here a new body of horse, called *equites Cæsarienses* (or *Cæsariani*) *Corionototæ*. The latter designation he supposes to be "a corruption of the Roman name of a people in these parts, perhaps *Curia* or *Coria Otadenorum*, and that *Corbridge* was the place." Horsley rejects this explanation, and proposes three other names, of which the word in the text may have been a corruption: *Coritani*, a people of one of the *Provinciæ Cæsarienses; Coriotiotar* in the anonymous *Ravennas*: and *Crotoniatæ*, which last he seems to have preferred. As to the explanation of the rest of the inscription, he adopts the view, that *præsentissimum numen Dei* signifies the Emperor, and that *manu* intimates that *Q. Calpurnius* was advanced to his post by the immediate hand of the Emperor, supposed to be *Commodus* or *Caracalla*.

The first doubt which presents itself as to the correctness of this interpretation, arises from the terms *equites Cæsarienses*. So far as I am aware, (and I have made a diligent search on the subject,) there is no example of any *equites* having been denominated *Cæsarienses*. As to the reference, which is made in Gordon's Appendix to Gruter, p. 445, it proves nothing to the point, for in that inscription there is no mention of *equites*. Nor is the well known form *equites singulares Cæsaris* applicable here.

Another doubt is suggested by the meaning given to *manu præsentissimi numinis dei*, as here too I have been unable to find any authority for the interpretation, "the immediate hand of the Emperor."

Under such circumstances I am inclined to regard *Cæsa* as the participle of *cædo*, and agreeing with *manu*, which I interpret as *band* or *body*. Of the suggestions relative to *Corionototarum*, I prefer that which considers it as a corruption of *Coriotiotar*. As to *præsentissimi numinis dei*, I understand the phrase as referring to the god to whom the altar was dedicated, and whose name, along with that of the legate, doubtless appeared on that part of the stone which has been broken off. In construction, *numinis* is governed by *cultor* understood: an ellipsis, which is confirmed by an inscription found in Portugal, and given by Gruter and Orelli:

DEO ENDOVELICO
PRAESTANTISS
IMI ET PRAESEN
TISSIMI NVMINIS
SEXTVS COCCEIVS
CRATERVS HONOR
INVS EQVES ROMA
NVS EX VOTO.

De Wal also gives this inscription in his *Mythologiæ Septentrionalis Monumenta* (p. 73), and in his interpretation correctly supplies *cultor* after *numinis*.

I read the inscription thus: Legato Augusti Proprætore, Q. Calpurnius Concessinius, Præfectus Equitum, cæsa Corionototarum manu, præsentissimi numinis dei [cultor] votum solvit.

According to this view, the circumstances under which the altar was erected were these:—Calpurnius Concessinius before going into action with a band of Coriototares vowed to some god, that, if successful, he would erect an altar to him. Having cut them to pieces he performed his vow in grateful acknowledgment of the aid of that deity, who had manifested on this occasion his characteristic of giving most timely and effectual assistance. The only objection which I see to the interpretation which I propose arises from the use of *præfectus equitum*, without giving the designation of those *equites*. To this it may, I think, be replied, that the *equites* engaged in this action were so well known at the time, that it was unnecessary to specify them; or that on the part of the altar which was broken off there may have been some notice that sufficiently indicated them; or that the force may have been composed of different parties, all of whom could not be stated, and hence it was considered better to omit all than to name some; or, finally, that we have other examples of this omission.

If my interpretation be correct this stone possesses unique interest, as the inscription is, so far as I am aware, the only one extant which records an engagement between the Romans and the Britons.

10. In Horsley's *Britannia Romana*, Northumberland, ix. a, we find the following copy of an inscription on a stone found at Benwell, the ancient Condercum:—

VICTORIAE
.. GG AIFE
NSSENECIO
N COS FELIX
ALAIASTO
...M PRA.

Horsley reads it thus : Victoriæ Augustorum nostrorum fecit nepos Sosii Senecionis consulis Felix alæ primæ Astorum præfectus.

There can, I think, be no doubt that this reading should be at once rejected. It is plain that the names in the second and third lines after AVGG are ALFENVS SENECIO ; and the only real difficulty in the inscription is the initial letter or letters of the fourth line before COS. To me it seems most probable that we should read instead of N either VC or V alone. In a mural tablet found at Risingham, as given by Bruce, (*Roman Wall*, p. 287,) and Surridge, (*Notices*, &c., Pl. III.,) we find the words ALFENI SENECI[O]NIS VOCOS, which, with *Henzen, n. 6701, I would read, as here, VC COS i. e. *vir clarissimus consularis.*

Alfenus Senecio was *legatus Augusti* in Britain under Severus and Caracalla, the two *Augusti* noticed in the Benwell inscription. He is mentioned also on two other stones found at Greta Bridge and Brough.

As the Risingham tablet gives the 3rd Consulship of Severus and the 2nd of Caracalla as the date of its erection, it may be inferred that Senecio was in the island at some time between 205 and 207 A. D.

From an inscription found at Naples, and given by Gruter, p. 208, Orelli, n. 4405, and Mommsen, n. 2646, it also appears that he was Sub-Præfect of the fleet at Misenum.

Horsley offers a suggestion as to tracing ASTORVM to *Asta* in Liguria, not to the Astures, a people of Spain. There can be no reasonable doubt, however, that the latter are intended. In Bruce's *Roman Wall*, p. 110, we have an inscription on a stone found at the same place, Benwell, which is decisive on the point :

* There are other difficulties in this inscription, on which, however, I do not feel competent to offer an opinion, as the only copies, which I have seen of it, are the above mentioned; and of these Bruce's is on too small a scale for distinctness, whilst Surridge's accuracy seems very doubtful. Indeed, if his copies of inscriptions be no more reliable than his interpretations, they are worse than useless. Henzen (as above cited) gives a restoration of the whole inscription with but partial success.

MATRIBVS CAMPEST
ET GENIO ALAE PR HISPANO
RVM ASTVRVM. &

As to the grammatical construction of the inscription, which forms the subject of this article, I supply *jussit* after COS, and *curavit* after PRAEF· i. e. Senecio jussit, Felix curavit.

11. In the year 1812, a *tabula honestæ missionis* was dug up at Malpas, in Cheshire. It is given by Lysons (*Reliq. Brit. Rom.*, i., p. iv.); and also by Wright (*The Celt, the Roman, and the Saxon*, p. 362), who supplies an English translation. The inscription ends with the words:—

* * * * * DVMTAXAT · SINGVLI · SIN
GVLAS · A D XIII K · FEBR
M · LABERIO MAXIMO II
Q GLITIO ATILIO AGRICOLA II CO
ALAE · I · PANNONIORVM · TAMPIANAE · CVI · PRAEEST
C · VALERIVS CELSVS · DECVRIONI
REBVRRO SEVERI · F · HISPAN
DESCRIPTVM · ET · RECOGNITVM · &c. &c.

Of these, Mr. Wright gives the following translation: "That is "to say, each with each. On the 13th kalends of February. To M. "Laberius Maximus twice and Q. Glitius Atilius Agricola twice "consuls, to the first ala of the Pannonians, termed the Tampian, "which is commanded by C. Valerius Celsus, to the decurion Rebur-"rus, son of Severus, the Spaniard. Copied and revised," &c.

In this translation there are some serious errors, which it seems important to point out, as the work, in which they are found, is justly regarded as a very useful and able compendium of British Archæology. The meaning of the words *dumtaxat singuli singulas*, is not expressed by "each with each." The sense is, "provided they have but one each." Martini (*Diss. super Claud.*) explains this as prohibiting their having more than one wife at the same time; but Spangenberg (*Tab. Neg.*, p. 520) regards it as a limitation of the privilege to one marriage; and, in confirmation of this view, refers to two *tabulæ*, in which *primæ* is expressed. Again, the words *M. Laberio Maximo* II. *Q. Glitio Agricola* II. *Co.* should not have

been translated as if they were in the dative case. The expression is the ordinary form in the ablative. Nor are *alæ primæ Tampianæ* in the dative. They are in the genitive after *decurioni*.

Reburrus, the son of Severus, a Spaniard, a decurio of the first ala of Pannonians termed the Tampian, is specially named, as one of those to whom the privileges of *civitas* and *connubium* were given, because this revised copy belonged to him, and was made for his use. The original at Rome gave the names of all those to whom the privileges had been ceded; in each copy made for an individual, only his name was given, with occasionally the addition of the names of his wife and children. The seven names (omitted in my extract), with which the inscription ends, are those of the witnesses who attested the truth of the copy. On this subject, *vide* Marini (*Atti de Frat. Arv.*, ii. p. 433); Platzmann (*Juris Romani Testimoniis*) Morcelli (*de Stil.*, ii. p. 309); Borghesi (*Actt. Acad. pont. Archæol.* x. p. 131); Cardinali (*Diplomi Imperiali*); and Henzen (*Rhein Jahrbb*, xiii. p. 98.)

FORMATION OF ICEBERGS AND TRANSPORTATION OF BOULDERS BY ICE.

BY JOHN RAE, M.D.

Read before the Canadian Institute, 29th January, 1859.

Having spent seven summers and two winters on the Arctic coast of America, although I did not particularly devote my attention to the phenomena connected with ice, I could not fail to notice some of the more remarkable aspects peculiar to such latitudes, especially as regards its formation into icebergs, and its power as an agent in carrying boulders and large masses of rock from one locality to another. Some notes of the results of such observations, slight as they are, may possibly be of interest to the members of the Canadian Institute, as embracing conclusions arrived at on the spot. In thus treating of these subjects, I may be repeating observations already set forth by others. If so, I must plead as an excuse, my ignorance of the fact, and my readiness to give way to any prior claims, if such be brought forward by their originators.

In the formation of icebergs such as I have to describe, a rocky or precipitous coast, with deep water close to the shore are requisite, and the precipices should run in a direction at right angles, or nearly so, to the prevailing winds, the face of the rocks being turned away from the direction of the wind.

During winter, in the Arctic regions, nearly all the gales of wind are from N. and N.W. These gales are very frequent, and either accompany or immediately follow every fall of snow, so that where there are precipices having a southern or eastern aspect, large drifts of snow are formed under their lee. If the water is deep, as it generally is, at the foot of these cliffs, the weight of snow forces the ice on which it rests down into the water, submerging with it the superincumbent snow, and all this submerged snow becomes frozen into a solid mass of ice. Every gale adds a fresh stratum of snow, so that in spring there may be a snow-drift more than one hundred feet in depth;* which, under such circumstances as I have described above, is from the same process of submergence and solidification. The process of submergence, however, has its limits, and above this the snow-drift goes on accumulating, in like manner with every succeeding gale. When the summer comes, the surface of these drift-banks is thawed, and the water filters through the snow underneath, which, being of a much lower temperature than 32°, causes the whole to freeze, in like manner, into a solid mass of ice.

A large portion of this ice, which once was snow, if the summer has not been a peculiarly mild one, remains until the following winter, when a fresh deposit takes place, and thus from year to year one accumulation succeeds another until the whole height from the base to the top of the cliff is filled up. This extends in a sloping direction (getting gradually thinner,) out to the sea, reaching to a greater or less distance according to the height of the cliff and other favouring circumstances. From time to time pieces break off from this accumulated mass of solid ice, and when the water is deep enough they are floated away in the form of icebergs. Frequently the ice separates from the cliff itself, and occasionally tears away large pieces of the rock along with it. Of this fact I saw some striking examples, whilst sailing in a ship through Hudson's Straits, on my way to England, in the autumn of 1854. We were close to the north coast of the Strait, which is very precipitous, and I could distinctly see large icebergs aground near

* I have seen a snow-drift of more than twenty feet deep formed in one night.

the shore, having on one side indentations and projections corresponding to the irregularities in the face of the precipice from which they had become detached.

The whole of the north shore of Hudson's Strait, which lies between lat. 61° and 64° north, and lon. 65° to 75° west, being lofty and precipitous, is well adapted for the formation of bergs; they are consequently very numerous, in some cases of very large extent, and more than one hundred feet high. In addition to these huge bergs, strong gales of wind and currents, acting separately or in concert, frequently force floes of ice one over the other, to the height of fifty or sixty feet. The whole freezes together and forms a kind of spurious iceberg, which is easily distinguished from the true one by its jagged and irregular form.

In Hudson's Bay there are few or no icebergs deserving the name, because there are no high rocks possessing the peculiarities requisite for their formation. For the same reason there are none to be seen along the northern shore of America, from Point Barrow in lon. 156° eastward, to Backs River, in lon. 96°. Neither are there any icebergs in Regents Inlet or Victoria Strait.

According to Dr. Kane's account, as given at page 149, vol. ii. of the narrative of his last voyage, the icebergs in Smith's Sound are formed in a very different manner from that which I have described, nor is there any reason why both descriptions, although differing, should not be essentially correct. Dr. Kane, when speaking of Humboldt's Glacier, says: "The enormous masses of the great Glacier are propelled, step by step and year by year, until reaching water capable of supporting them they are floated off to be lost in the temperature of other regions."

The great changes and difference in the forms and color of icebergs arise from the turning over of these floating islands. The ice wastes faster under water than it does with air, and the iceberg becoming top heavy changes its position until its equilibrium is restored.

When at Repulse Bay in the spring of 1847, I was somewhat surprised to observe that as the sea ice wasted away by the combined effects of thaw and evaporation, boulders of from three to four feet in diameter appeared on the surface of the ice, at such a distance from the land as entirely to preclude the idea that they had rolled thither from the low flat shore in the neighbourhood. These boulders were

certainly not on the ice in the autumn, and as the sea in the bay had frozen over perfectly smoothly, there was only one way in which I could rationally account for these large stones getting so placed. By observation in the same locality in 1853—4, I fully satisfied myself as to the correctness of the theory which I now mention.

The shores at Repulse Bay are in many places flat and shelving, and are thickly strewn with boulders of various sizes. The rise and fall of the tide is from six to eight feet, so that there is a considerable extent of beach exposed at low water. In the latter part of September when the sea begins to freeze, the ice settles down with the ebb and in many cases rests upon the boulders, by which either holes are broken through the ice corresponding to the boulders on which it rests, or it is raised up in the form of a cone over where the stone lies. As the ice acquires thickness a cavity is formed of the shape of the upper part of the boulder, to which after a time the boulder adheres with sufficient tenacity to raise it from its bed. After this the whole process is simple. As the tide ebbs and flows, the boulder rises and falls with the ice, and as the latter thickens it becomes completely embedded in it. The ice in the locality where my observations were made, in the month of April had attained a thickness of more than eight feet. For a month or so after this, the thickness remains the same, as the evaporation from the surface is about equal to the additional freezing underneath. The thaw in May and June goes on so rapidly that by the first week in July, the boulders, which in the previous autumn had been below the ice, are now above it, supported on ice four feet or more thick, and solid enough to be drifted by winds and currents hundreds of miles before becoming too much wasted to carry its load.

Pieces of rock much larger in size than those I have described may be carried very great distances when they are attached to icebergs, either by falling from or being torn out of the precipices where the icebergs are formed; and such transported blocks are doubtless strewed all along the bed of the Atlantic, in the course over which the icebergs float into more southern latitudes, until, melting in the gulf stream, they drop the huge masses of rock, torn from the cliffs of Greenland and the Arctic coasts, thousands of miles apart from the parent cliff from which they have thus been severed.

ON THE FORMATION OF MAGNESIAN LIMESTONES.

BY T. STERRY HUNT,
OF THE GEOLOGICAL SURVEY OF CANADA.

At a meeting of the Canadian Institute, held on April 10th, 1858, Professor Chapman produced, and deposited with the Institute, a sealed packet containing a notice of certain investigations and demonstrative experiments then in progress, by Mr. T. Sterry Hunt, of the Canadian Geological Survey. Mr. Hunt's investigations having now been sufficiently advanced to admit of the publication of his views, the sealed packet has been opened, by his directions, and is herewith appended to the communication, which sets forth the special views he claims to have adopted at the annexed date.—Ed. *Can. Jour.*

NOTE ON THE ORIGIN OF DOLOMITES.—BY T. STERRY HUNT.

The results of a long series of investigations and experiments relative to the formation of dolomites or magnesian limestones, have led me to reject the idea of their metamorphic origin from the alteration of limestones in the manner generally understood. I conceive that dolomites have been formed in sea basins, from which the soluble salts of lime have been completely separated, as sulphate or as carbonate by the agency of alkaline carbonates, which afterwards give rise to carbonate of magnesia. This carbonate appears capable, under certain conditions, of slowly combining with carbonate of lime, and forming with it a double carbonate, which is dolomite.

The experiments required for the complete demonstration of this theory are as yet unfinished, but I wish by this note to take priority in the solution of a difficult and hitherto unresolved problem in Chemical Geology.

Montreal, March 30, 1858.

The mode in which magnesian limestones occur, often interstratified with beds of pure carbonate of lime, has induced some recent observers to reject the notion which supposes dolomite to have been formed by the alteration of beds of limestone, whether by magnesian vapours, as supposed by Von Buch, or by the intervention of magnesian solution, as conjectured by Haidinger and Von Morlot.

The observations of Coquand and Delaouë have led them to conclude that dolomites have, in many cases at least, been formed by the precipitation of carbonate of magnesia mingled with carbonate of lime. It was, however, still necessary to the solution of the problem of the origin of dolomites to show, first, the conditions under which carbonate of magnesia could be found and deposited; and, secondly, how it could be made to unite chemically with carbonate of lime to form the double salt dolomite.

In the Report of the *Geological Survey of Canada*, for 1857 (see also *Am. Jour. of Science* (2), vol. xxxvi. 110), I have shown two processes by which sediments of magnesian carbonate may be formed. First, by the action of solutions of bicarbonate of soda on basins of sea-water, which precipitate all the lime as carbonate, and then give rise to a soluble bicarbonate of magnesia; and, secondly, the action of bicarbonate of lime on solutions containing sulphate of magnesia. I have found that the presence of this salt greatly increases the solubility of bicarbonate of lime in water—bicarbonate of magnesia and sulphate of lime being formed by double decomposition. By adding alcohol to such a solution, or by evaporating it at a gentle heat, gypsum is deposited, leaving the more soluble bicarbonate of magnesia in solution.

In the same way, alcohol separates gypsum from a mixed solution of bicarbonate of lime and sulphate of soda—an alkaline bicarbonate remaining dissolved.

The subsequent evaporation in shallow lakes, or basins, of solutions of bicarbonate of magnesia, formed by either of the above mentioned processes, must give rise to deposits of hydrated carbonate of magnesia more frequently mingled with carbonate of lime, supplied by springs containing either bicarbonate of lime or chloride of calcium. The hydrated carbonate of magnesia, at 160° C. (and perhaps at a lower temperature), under pressure to prevent the loss of carbonic acid, is converted into magnesite or anhydrous carbonate of magnesia; but if carbonate of lime be present, the two combine to form a double carbonate, which is dolomite, and may be separated from intermixed carbonate of lime by the action of dilute acetic acid, at 32° F., which readily dissolves the latter, but attacks the dolomite more slowly.

I have found this union of the two carbonates to take place alike in the presence of earthy and alkaline chlorides, sulphates, and car-

bonates, at temperatures between 130° and 200° centigrade. A portion of the magnesia is always, under these conditions, converted into magnesite, and may be partially separated from the dolomite, by taking advantage of the fact that it is less soluble in acetic acid at the temperature of 60° F. than the double carbonate. In nature, the combination must take place at the lowest possible temperature, and one which is probably insufficient to produce the insoluble magnesite. This, when once found, I have shown to have no tendency to unite with carbonate of lime.

The application of these observations to the various conditions in which dolomites and magnesites are met with in nature, and especially to their association with gypsum and anhydrite, is evident. The details of my experiments will appear in the Report of the Geological Survey for 1858.

Montreal, 25th April, 1859.

REVIEWS.

Wanderings of an Artist among the Indians of North America, from Canada to Vancouver's Island and Oregon, through the Hudson's Bay Company's Territory and back again. By Paul Kane. London: Longmans, 1859.

It has been long familiar to Canadians that we had among ourselves one who, in search of the materials for his art as a painter, had explored the great North-West, and brought back with him many graphic records and curious reminiscences of Indian life. The pages of our own Journal have been repeatedly enriched from his notes of travel, and we hail with cordial welcome the issue of the full narrative of his wanderings in so tasteful and creditable a form. With somewhat of the stoical taciturnity of his Indian friends, our author has been in no hurry to invite the public to share in his strange and stirring adventures. He began his wanderings some fourteen years ago, in the summer of 1845, and returned to Toronto in 1848; so that he has brooded over these notes of his far wanderings for more than the Horatian term, while working out his pencillings into more complete and enduring forms. We are glad, however, to have good

proof in the completed volume, that no part of this interval has been spent in book-making; but, on the contrary, that we have here the notes of the observant traveller in all their freshness and original piquancy. And it would be difficult to conceive of one better fitted to travel for us in a strange wild land, among the savage children of its forests and prairies, than an artist, with sketch-book and note-book in one. An observant eye he must have, a keen appreciation of every striking minutiæ of detail, and a discriminating perception of all that is most characteristic in the strange locality and its stranger occupants; but along with this it is rare to find the painter gifted with any power of the pen. He will open out to you all the felicitous pencillings of his sketch-book, and all the rich coloring of his portfolio, but his art goes no farther; and with the dumb eloquence of his canvas must the student be satisfied. Here, however, without any ambitious attempt at literary workmanship, we have a spirit-stirring journal of adventures and strange perils encountered among the Indians of the North-West, for the purpose of preserving, by means of the pencil, some permanent record of races already changing, and destined ere long to pass away.

The term of fourteen years is no very long period, yet it is a strange proof of the contrast which that wild North-West presents to our eastern clearings, that such an interval could be allowed to pass between our author's observations and their publication, without any change in the tenses of his verbs being needful. His own experiences in his native Canadian Village, as referred to in his preface, sufficiently illustrate this. Among its primitive log-houses and temporary frame-buildings on the banks of Ontario, he had passed his boyhood, familiar with the Indians, who still found their game among the water-fowl of the Bay, or in the thickets of the surrounding forest, and were then rather attracted than scared, by the diminutive clearings of the earlier colonists. But the same energy which at a later period sustained our Canadian artist in his perilous adventures among the tribes of the far West, led him in earlier years to visit Europe for the facilities it afforded in the study of his profession as a painter. With funds, exceedingly moderate in amount, but all amassed by his own sturdy toil, he passed months of profitable study amid the teachings of Rome's immortal treasury of art; and, if we mistake not, has, pencil in hand, had a peep at some nooks in each of the four quarters of the globe. But his Canadian village did not

stand still, meanwhile, as the scenes of his western wanderings have seemed to do. "On my return to Canada," says he, "from the continent of Europe, where I had passed nearly four years in studying my profession as a painter, I determined to devote whatever talents and proficiency I possessed to the painting of a series of pictures illustrative of the North American Indians and scenery. The subject was one in which I felt a deep interest in my boyhood. I had been accustomed to see hundreds of Indians about my native village, then Little York, muddy and dirty, just struggling into existence, now the City of Toronto, bursting forth in all its energy and commercial strength. But the face of the red man is now no longer seen. All traces of his footsteps are fast being obliterated from his once favourite haunts, and those who would see the Aborigines of this country in their original state, or seek to study their native manners and customs, must travel far through the pathless forest to find them." Travel far, accordingly, he did, and the long interval since his return has been spent in completing a series of paintings in oil, including portraits of chiefs, warriors, and celebrated medicine men, as well as of Indian beauties; pictures of dances, hunts, and other characteristic scenes illustrative of Indian life, along with landscapes depicting the strange scenery of the unexplored West. Some of the illustrations given in the present volume, such as the Chimney Rock, present its striking geological features, others cannot fail to interest the ethnologist, and this the accompanying narrative tends to increase.

The portrait of Mancemuckt, for example, the Chief of the Skene tribe on the Columbia River, is full of ethnic character, and no less so is that of Ogemawwah-Chack, "The Spirit Chief," an Esquimaux from the Hudson's Bay, who, according to received opinion, was 110 years old at the time his portait was taken: and Mr. Kane adds, "The events which he related as having witnessed seemed to warrant the belief. He had an only son, whom I often met, quite elderly in appearance. The mother of this boy had died very shortly after his birth, and there being no woman giving suck near at the time, the father, to soothe the cries of the starving infant, placed the child's mouth to his own breast, and finding that the child derived some benefit from it, he continued the practice for some days, and, strange to say, milk flowed from his nipples, and he brought up the child without the assistance of any woman."

Dr. Livingstone, it will be remembered, declares such nursing of orphan infants by a masculine wet-nurse to be a well recognized practise in some of the African localities he explored; and the confirmation of so singular a physiological novelty among the Arctic Esquimaux would be of no slight value. As, however, old Ogemawwah Chack's nursling had long since achieved his weaning before Paul Kane received his assurance of the fact, the most we can assume is, that the Esquimaux have faith in such means of encountering one of the most puzzling trials of a solitary widower.

Among the landscape illustrations of the volume is the wood cut of "Chimney Rock," as strange an illustration of the freaks of Nature in some of her wilder geological escapades as is often to be met with. and accompanying it is the following legend, which will furnish a fair example of the pleasant manner in which the author's pen and pencil sketches are combined:

"As we approached the place where the Walla Walla debouches into the Columbia River, we came in sight of two extraordinary rocks projecting from a high steep cone or mound about 700 feet above the level of the river. These are called by the Voyageurs the Chimney Rocks, and from their being visible from a great distance, they are very serviceable as land marks.

"The Walla Walla Indians call these the "Rocks of the Ki-use Girls," of which they relate the following legend, which was told me by an Indian whilst I was sketching this extraordinary scene. It must be borne in mind that all Indian tribes select some animal to which they attribute supernatural, or, in the language of the country, *medicine* powers: the whale, for instance, on the north-west coast; the Kee-yea, or war-eagle, on the east side of the Rocky Mountains, supposed to be the maker of thunder; and the wolf on the Columbia River. Now the great Medicine Wolf of the Columbia River, according to the Walla-Walla tradition, the most cunning and artful of all manitous, having heard that a great medicine grasshopper was desolating the whole country which of right belonged to himself, and was especially under his protection, immediately resolved to trace him out and have a personal encounter with him. With this view, he proceeded down the banks of the river, and soon fell in with the object of his search. Each of these formidable manitous thought it best to resort to stratagem to overcome his opponent. Being afraid of each other's "medicine" powers, they accordingly commenced by exchanging civilities, and then, with a view of terrifying each other, began boasting of their wonderful exploits, and the number they had killed and eaten. The grasshopper said to the wolf that the best way to ascertain who had devoured the largest numbers would be to vomit up the contents of their respective stomachs. The grasshopper, in the violence of his exertions, naturally closed his eyes, and the wolf, perceiving this, adroitly drew a great part of his opponent's share over to his own side without being detected. The grasshopper, when he perceived how much larger the pile before the wolf was than his own, gave up

the contest, and proposed to the wolf an exchange of shirts in token of amity and forgiveness. To this also the wolf consented, but requsted the grasshopper to take off his shirt first as he was the first proposer; but the grasshopper refused, and wished the wolf to commence the ceremony.

"The wolf finally agreed to this, and striking himself suddenly on the breast, his shirt immediately flew off. The grasshopper was greatly astonished, and not being possessed of any charm by which he could strip himself so expeditiously, was obliged to take off his shirt in the common way of drawing it over his head; the wolf now watched his opportunity, and while the grasshopper had his head and arms entangled in the shirt, he killed him.

"The wolf having thus got rid of his troublesome and dangerous rival, commenced his return home. On arriving within a few miles of the Walla-Walla he saw three beautiful Ki-use girls, with whom he fell desperately in love. They were engaged in carrying stones into the river, in order to make an artificial cascade or rapid, to catch the salmon in leaping over it. The wolf secretly watched their operations through the day, and repaired at night to the dam and entirely destroyed their work. This he repeated for three successive evenings. On the fourth morning he saw the girls sitting weeping on the bank, and accosted them, inquiring what was the matter; they told him they were starving, as they could get no fish for want of a dam. He then proposed to erect a dam for them, if they would consent to become his wives, to which they consented sooner than perish from the want of food. A long point of stones running nearly across the river is to this day attributed to the magic of the wolf-lover.

"For a long time he lived happily with the three sisters,—a custom very frequent among Indians, who marry as many sisters in a family as they can, and assign as a reason that sisters will naturally agree together better than strangers, —but at length the wolf became jealous of his wives, and by his supernatural power changed two of them into the two basalt pillars, on the south side of the river, and then changed himself into a large rock, somewhat similar to them, on the north side, so that he might watch them for ever afterwards. I asked the narrator what had become of the third sister. Says he, 'Did you not observe a cavern as you came up?' I said I had. 'That,' he replied, 'is all that remains of her!'"

Accompanying the portrait of Kee-akee-ka-saa-ka-wow, is a highly interesting account of the artist's interview with this distinguished warrior, the head Chief of the Crees: who robed himself in his most magnificent costume, and uncovered one of his Medicine pipe-stems, in order to have his portrait taken with full effect. Mr. Kane's ordinary mode of treating his Indian sitters, however, left them little opportunity of getting themselves up for the occasion. "Usually," says he, "when I wished to take the likeness of an Indian I walked into the lodge, sat down, and commenced without speaking, as an Indian under these circumstances will generally pretend not to notice. If they did not like what I was doing they would get up and walk

away; but if I asked them to sit they most frequently refused, supposing that it would have some injurious effect upon themselves."

The incidents connected with some of Mr. Kane's attemps to secure a "sitting," furnish curious and amusing illustrations of Indian manners, and along with other portions of his lively and spirited narrative, open up exceedingly picturesque glimpses of Indian life. But before noticing one or two of them, let us follow him on the way to one of his pictorial experiences. Proceeding to Vancouver's Island on one occasion, he thus describes the navigation of an arm of the Pacific under native pilotage:—

"At 3 o'clock, A. M., we embarked and proceeded to make a traverse of thirty-two miles in an open sea. When we had been out for about a couple of hours the wind increased to a perfect gale, and blowing against an ebb tide caused a heavy swell. We were obliged to keep one man constantly bailing to prevent our being swamped. The Indians on board now commenced one of their wild chants, which increased to a perfect yell whenever a wave larger than the rest approached; this was accompanied with blowing and spitting against the wind as if they were in angry contention with the evil spirit of the storm. It was altogether a scene of the most wild and intense excitement; the mountainous waves roaming round our little canoe as if to engulph us every moment, the wind howling over our heads, and the yelling Indians, made it actually terrific. I was surprised at the dexterity with which they managed the canoe, all putting out their paddles on the windward side whenever a wave broke, thus breaking its force and guiding the spray over our heads to the other side of the boat.

"It was with the greatest anxiety that I watched each coming wave as it came thundering down, and I must confess that I felt considerable fear as to the event. However, we arrived safely at Fort Victoria, at 2 P. M., without further damage than what we suffered from intense fatigue, as might be expected from eleven hours' hard work, thoroughly soaked, and without food. One of the Indians told me he had no fear during the storm, except on my account, as his brethren could easily reach the shore by swimming, even should the distance have been ten miles."

Once safely ashore, our artist-traveller employs himself busily on Indian portraiture. While taking the likeness of one Indian he unceremoniously ejects all others, and among the rest one is summarily turned out of doors who struck him only as being of a very plain and unprepossessing appearance. Half an hour after he learns that he has abruptly ordered out of doors Yellow-cum, the head chief of the Macaws, a warrior feared and detested by his enemies the Clallum Indians, and whose fame had led Mr. Kane to project a journey of sixty miles to see him. Yellow-cum proved placable, on receiving the explanations and flatteries of the courtly painter and

Medicine-man, addressed to his high mightiness; but, at the same time, he stated that his pride had been wounded, and he had felt extremely mortified at being treated so before so many Indians. Yellow-cum accompanied the artist to his temporary study, and while he was making a sketch, gave him a recital of much of his private history, some of the notes of which are of special interest. Much of Mr. Kane's success depended on the universal reputation he acquired as a Great Medicine-man from the practice of his art, and the mysterious ideas associated with his life-like portraits, which were regarded as sources of influence for good or evil over the originals, if not indeed a part of themselves. This superstitious estimate of his art manifested itself in various ways. On one occasion he tells us:

"I visited the lodges of the Eus-a-nich Indians. The chief was very rich, and had eight wives with him. I made him understand, by showing him some sketches, that I wished to take his likeness. This was, however, opposed so violently by his ladies, that I was glad to escape out of reach of their tongues, as they were all chattering together, while he sat like a grand Turk, evidently flattered by the interest they showed for his welfare. A few days after I met the chief some distance from his camp and alone, when he willingly consented to let me take his likeness upon my giving him a piece of tobacco."

Again he tells us of his success in securing the portrait of Shaw-stun, the head chief of the Sinahomas, who attracted his attention first by his pre-eminent ugliness. "He inquired very earnestly," he adds, "if my sketching him would not involve the risk of his dying; and after I had finished the sketch, and given him a piece of tobacco, he held it up for some moments and said it was a small recompense for risking his life. He followed me afterwards for two or three days, begging of me to destroy the picture; and at last, to get rid of him, I made a rough copy of it, which I tore up in his presence, pretending it was the original." Repeatedly Mr. Kane was indebted for his safety to the superstitious fears which his paintings excited; and in one case, when an Indian had pursued him for some days and occasioned him great annoyance, he effectually subdued him by the mere threat of taking his likeness. During his stay among the Cowlitz Indians, a tribe of Flat-heads, Mr. Kane painted Caw-wa-cham, a woman of the tribe, with her child under the process of having its head flattened, and the picture forms one of the most curious illustrations of the present volume. But he adds, "It was with some

difficulty that I persuaded her to sit, as she seemed apprehensive that it would be injurious to her. At a later date he tells us:

"I again crossed Prairie de Bute, and arrived at my old friend Kiscox, the Chief of the Clalum's, Lodge; but, to my astonishment, I found him and his family unusually distant in their manners, and the children even running away from me and hiding. At last he asked if I had not taken the likeness of a woman when last among them. I said that I had, and mentioned her name, Caw-wacham, A dead silence ensued, nor could I get the slightest answer to my inquiries. Upon leaving the lodge I met a half-breed, who told me that Caw-wacham was dead, and that I was supposed to be the cause of her death. The silence was occasioned by my having mentioned a dead person's name, which is considered disrespectful to the deceased, and unlucky. I immediately procured a canoe, and started for Fort Vancouver, down the river, paddling all night, well knowing the danger that would result from my meeting with any of her relations."

The descriptions and drawings of Indian customs, games, and dances, and of remarkable local scenery, are no less interesting; but for these we must refer the reader to the book itself. There is only one of the illustrations—that of the Cree Half-breed, which forms the frontispiece,—which we cannot commend. The original painting, with which we are familiar, presents an exceedingly interesting illustration of the blending of the white and Indian features in the female Half-breed. But the London chromo-lithographer has sacrificed every trace of Indian features in his desire to produce his own ideal of a pretty face, such as might equally well have been copied from an ordinary wax doll.

Mingling among the Indians as a great Medicine-man, respected or dreaded for his supernatural powers, Mr. Kane witnessed many singular rites and customs not often seen, and never before narrated by a traveller. Without being either a critical linguist, or an ethnologist, he has accumulated many facts highly valuable to both; and now, when this volume appears so opportunely, just as public interest is concentrated both here and at home on the Red River, the Columbia, Frazer's River, and Vancouver's Island, there must be a numerous class of readers to whom its pages will prove full of attractive materials. In a very few years—judging from the rapid progress of settlement which the gold diggings of Frazer River, and the commercial facilities of Victoria, have originated,—these wanderings of an artist among the Indians of North America will possess another interest, as the record of a condition of things as rapidly disappearing as the traces of aboriginal arts from our own Canadian clearings.

One more brief extract we must find room for. The volume is inscribed, in a graceful dedication, to George William Allan, Esq., of Moss Park, Toronto, "as a token of gratitude for the kind and generous interest he has always taken in the author's labours," and after referring to a Commission with which he has been honored by the Canadian Legislature, for the execution of a selection of paintings from his Indian studies, he alludes to the extensive series cf oil paintings executed by him for his liberal friend and patron, Mr. Allan. These amount in all to upwards of a hundred, including many highly characteristic life-size portraits, pictures of Indian games, dances, hunts, and combats, and of their lodges, cemeteries, canoes, &c., as well as of studies of the remarkable scenery on the great rivers of the North-West. In addition to these, Mr. Allan also possesses a valuable collection of Indian dresses, weapons, implements, carvings, medicine rattles, pipes, &c., obtained by the author during his travels. At one time Mr. Kane indulged the hope that these, with his sketches and notes, would have been made the basis of a national work, to be undertaken by the authority of the Provincial Legislature; and few works could be more welcome to the students of ethnological science. Meanwhile it is gratifying to know that the materials have been preserved by the liberality of a native Canadian; and we cordially sympathise in the remarks with which the author concludes his preface: "I would gladly indulge the hope that the present work will not prove the sole published fruits of my travels among the Indian tribes of North America, but that it will rather be a mere illustration of the novelty and interest which attach to those rarely explored regions, and enable me to publish a much more extensive series of illustrations of the characteristics, habits, and scenery, of the country and its occupants."

D. W.

The Bookseller, a Hand-book of British and Foreign Literature. Nos. XIII. XIV. London: 1859.

This British periodical—a curious and acceptable product of the division of labor, begot by an age without its equal for rivalry and competition,—reaches us with the imprint of James Campbell, an enterprising wholesale Bookseller and Publisher, recently established ou Canadian soil. It devotes itself specially to "THE TRADE," or gentle craft of Booksellers, with a fair recognition also of all that is

noticeable in reference to the secondary and altogether subordinate guild of book-makers: the authors,—manufacturers of what, after all, we presume the Trade look upon as mere raw material, till the MS. has passed through their refining manipulation of reader's copy, proofs, and sheets; and folders' and binders' hot-pressing, stitching, boarding, and binding; with all the advertising mysteries of preparatory announcement, and final notices of the press. Here, for example, is a word in defence of the bookseller,—not in his lofty capacity as enthroned in The Row, and giving final judgment of life or no-life, to the still unprinted MS. of the trembling author, guilty of a first work,—but as the mere retailer, the trader in books. See what high functions pertain to this, the mere diaconate of such literary priesthood:

"The bookselling business is rather like a profession than a trade; but, unfortunately, book-buyers, as a whole, are too prone to overlook this in all its bearings, for when they are desirous of consulting the intelligent bookseller professionally, they too frequently haggle with him in a manner they would feel ashamed to do with their butcher or tailor. A clergyman, we will suppose, wants materials for particular sermons; a barrister, particulars respecting some case in hand; a member of Parliament, some details for his speech: off each one goes to the bookseller, occupies a great deal of his time, and, after half an hour's talk, feels himself at liberty to cheapen a five-shilling book. All our trade-readers can supply scores of instances where this has been the case, and where the time spent over the customer has in value greatly exceeded the profit on the purchase, even when the full price has been paid—how much more, then, when the discount has been applied for?"

If such are the acolytes, what must the sovereign pontiffs of the Row be: the Longmans and Murrays, Simpkins, Whittakers, and Rivingtons? To such the author must approach, with his unborn work, disposing his manuscript at their feet with all the trembling awe with which the ancient suppliant laid his sacrifice on the altar, and propitiated the priest ere he dared to consult the sacred oracle! From such tribunal Milton—one of the immortals,—accepted his award of five pounds for a Paradise Lost. And James and Horace Smith—representatives of the commoner order of literary mortals,—have told the tale of their modern experience with the oracle. Their famous "*Rejected Addresses*," now in a twenty-fourth or twenty-fifth London edition, and with incalculable American re-prints, became at first *rejected* addresses, in a sense they had not dreamt of when choosing the title. Their story is worth laying to heart. "Alas," says one of them, in the preface to the eighteenth edition, when con-

gratulating themselves, as authors, on the completion of their task, "Alas, our difficulties, so far from being surmounted, seemed only to be beginning. Strangers to the arcana of the bookseller's trade, and unacquainted with their almost invincible objection to single volumes of low price, especially when tendered by writers who have acquired no previous name, we little anticipated that they would rèfuse to publish our *Rejected Addresses*, even although we asked nothing for the copyright. Such, however, proved to be the case. Our manuscript was perused and returned to us by several of the most eminent publishers. Well do we remember betaking ourselves to one of the craft in Bond Street, whom we found in a back parlor, with his gouty leg propped upon a cushion, in spite of which warning he diluted his luncheon with frequent glasses of Madeira. 'What have you already written?' was his first question, an interrogatory to which we had been subjected in almost every instance. 'Nothing by which we can be known.' 'Then I am afraid to undertake the publication.' We presumed timidly to suggest that every writer must have a beginning, and that to refuse to publish for him until he had acquired a name, was to imitate the sapient mother who cautioned her son against going into the water until he could swim. 'An old joke—a regular Joe!' exclaimed our companion, tossing off another bumper. 'Still older than Joe Miller,' was our reply; 'for, if we mistake not, it is the very first anecdote in the *facetiæ* of Hierocles.' 'Ha, sirs!' resumed the bibliopolist, 'You are learned, are you? so, soh! Well, leave your manuscript with me; I will look it over to-night and give you an answer to-morrow.' Punctual as the clock we presented ourselves at his door on the following morning, when our papers were returned to us with the observation,—'These trifles are really not deficient in smartness; they are well, vastly well for beginners; but they will never do—never. They would not pay for advertising, and without it I should not sell fifty copies.'" A publisher, however, was found at length, to whom, when success had established the merits of their clever satire, they effected a sale of their collected Imitations of Horace, and their half-share in the joint copyright for one thousand pounds!

The rogueries of book-puffing, preparatory announcements, "*Just published*" notices of books still unborn; "*Nearly readys*" of books not yet in the compositors' hands, &c. New editions, second, third, and fourth, all effected by mere reprints of title-page; advertised

favourable notices, ingeniously culled from damnatory reviews; and a thousand other tricks of The Trade: have all been told long ago. But we see that the Westminster Reviewer, for April, in his "Morals of Trade," leaves out "THE TRADE" par excellence, to turn against the authors and their immoralities.

A deplorable picture he does draw of mercantile and trading morals, filling the ample canvass so thoroughly that we would gladly believe there is no room left for the author to be dragged into such company. "The remark of Dr. Darwin, that the law of the animal creation is, 'Eat and be eaten,' may be paralleled with respect to our trading community, of which the law appears to be, 'Cheat and be cheated!'" Unhappily the accusation does not appear for the first time in this Westminster article. The reviewer might have taken his motto from Tennyson's "Maud," with a singular appropriateness to the present condition of Europe:—

Is it peace or war? Better war! loud war by land and by sea,
War with a thousand battles, and shaking a hundred thrones.
For I trust if an enemy's fleet came yonder round by the hill,
And the rushing battle-bolt sang from the three-decker out of the foam,
That the smooth-faced snub-nosed rogue would leap from his counter and till,
And strike, if he could, were it but with his cheating yard-wand, home.

The author of "The Morals of Trade," has nothing to say against the booksellers, or if he has he keeps it to himself. But after noticing imagined comments on the misdoings of the mercantile world, from the Solicitor, the Barrister, and other representatives of professional respectability, not, in his estimation so entirely without sin as to justify them in casting the first stone, the Reviewer proceeds: "Does the condemnation come through the press? The condemned may remind those who write, of the fact, that it is not quite honest to utter a positive verdict on a book merely glanced through, or to pen glowing eulogies on the mediocre work of a friend, while slighting the good one of an enemy; and may further ask, whether those who, at the dictation of an employer, write what they do not think, are not guilty of the serious offence of adulterating public opinion."

It would seem indeed to be the fashion, among critical penmen of the present day, to make a special set at the author's weak points. Here, for example, is Dr. Charles Mackay's last effusion of the kind, in his satirical poem styled "SAFE PREDICTIONS!" After making his safe predictions of the patriot, the disconsolate widow, the

wealthy sunshine-friend, and the politician bent on "serving his country," he thus handles the author; though, as will be seen—with an author's experience,—he has a niche reserved for the critic too:—

Whene'er an author shows you meekly
His last new book,
And says all critics, daily, weekly,
Its faults o'erlook,
And praise it far beyond its merits—
On this decide,
He ranks himself with choicest spirits,
And bursts with pride.

Whene'er a critic o'er his duties
Still snarls and snaps;
Affirms all faults, and speaks of beauties
With cold "perhaps,"
Hunts for small flaws with keenest pleasure
From day to day;
The man's a donkey; know his measure;
And let him bray.

In reference to all such matters the "Bookseller" is the organ of the trade. Its monthly obituaries record the demise of bibliopolic notabilities; and its historical narratives tell of the grand achievements of publishing and bookselling enterprise. Moreover, as such, it professes to have glimpses behind the curtain; to know who the great unknowns are; and from time to time to let its readers into the secret. Since the death of T. K. Hervey a certain change has been noticable in the tone of the Athenæum, ascribable to the consequent changes in editorial generalship. A paragraph in the "Bookseller," for February, admits us into the Athenæum's editorial sanctum, in its zeal on behalf of the occupant:

"The *Saturday Review*," says our Trade organ, "is supposed to be edited by a gentleman who has long been connected with the press—Mr. Cooke, formerly of the *Morning Chronicle*,—and he might be supposed to understand what is due from one literary gentleman towards another; yet, in the *Review* for February 12th, we find the editor of the *Athenæum*, Mr. Hepworth Dixon, designated as 'dull, pompous, factious, ill-informed, and inaccurate;' also as a 'garbler of historical evidence.' Has not the editor any control over the 'gentlemen' who condescend to write in the *Saturday Review*?"

So then, Mr. Hepworth Dixon is the new editor of the *Athenæum*. This at least accounts for the style in which Macaulay has been handled of late in the columns of that literary periodical. Again

we learn that its rival, and senior, the *Literary Gazette*, is—or is supposed to be—under the editorial conduct of Mr. Shirley Brooks. The latter learned editor,—if we mistake not,—personally or by deputy, first recorded recently the re-interment of John Hunter's remains, in Westminster Abbey, ***between the graves of Ben Jonson aud Wilkie !*** This was too good a catch for his critical brother; and here accordingly is a specimen of the literary amenities between those knights of the critical quill whom the Trade periodical would drag from behind their prescriptive curtain of anonymity :

"The world of fine sentiment has been shocked by reports in the newspapers that the gentlemen who have found the bones of John Hunter in one grave and deposited them in another, 'between the bodies of Wilkie and Jonson,' have been tossing the skull that shaped 'Volpone' and 'The Alchemist' from hand to hand. The words on Shakspeare's tomb have naturally risen to every reverential and poetic lip. But we dare say the skull of Jonson is as mythical as the body of Wilkie—and, perhaps, the bones of Hunter. The body of Wilkie, as Capt. Joy can testify, lies in the bed of the Mediterranean. Gentlemen who know that Wilkie lies in a particular spot of Westminster must be good authority (very good) for any particular skull being that of Ben Jonson."

The world at large, and none more so than the American literary world, has a keen hankering after such personations of the anonymous editorial or critical WE. A learned American editor recently achieved more notoriety than he aimed at, by an indignant assault on the Rev. Sydney Smith, (!) for an article in the Edinburgh Review, less complimentary to the Great Republic than the patriotic editor was prepared to accept, even from the pen of Peter Plymley. Messrs. Leonard, Scott & Co., of New York, the American re-printers of the British Reviews, in their "Circular to Editors with whom we exchange," issued during the present season, still name Professor Fraser, of Edinburgh University, as the editor of the *North British*, in ignorance seemingly of the feud of orthodoxy and independence, in the midst of which he threw up his editorial pen. Private rumor hints to us of its being now wielded—after being in commission for some time,—by the Rev. Mr. Dun of Torphichen, an amiable country clergyman of a scientific and literary turn; but who has yet his spurs to win in the literary arena. Sir Cornwall Lewis appears to be the latest known editor of the *Edinburgh Review*, in New York circles—in the west, as we have seen, the responsibility still devolves on Sydney Smith. Lockhart would seem to be the last editor of the *London Quarterly* heard of by its New York re-printers. The

Bookseller tells us that Mr. Whitwell Elwyn,—formerly on the staff of the *Literary Gazette*,—now fills his chair. So also, all who are curious may cull from the *Bookseller's* gossip hints as to the editorial forces of *Bentley's New Quarterly*, the *Irish Literary Gazette*, the *Eclectic*, and a host of other periodicals, old and new.

Whatever editor or author specially desires to keep secret it forthwith becomes the duty of the *Bookseller* to hunt out and make public; for are not author and bookseller as naturally antagonistic as spider and fly, painter and picture-dealer, or architect and building committee? The monument of Dr. Johnson, in St. Paul's, is said, from its pose and burly proportions, to represent the author who felled the bookseller! Its vicinity to "The Row" has not, we fear, had all the moral weight on the fraternity haunting Ave Maria Lane, Amen Corner, and the neighbouring purlieus, that authors would desire. More recently an author, entertained at a booksellers' dinner, insisted on drinking Napoleon's memory, as one worthy to be had in reverence, at least by authors,—for did he not shoot a bookseller! No author's secret shall therefore be safe henceforth, if the *Bookseller* can ferret it out; and abundant thanks will reward the bibliopolic gossip for his zeal.

The world at large greatly covets a knowledge of all such literary secrets as are implied in anonymous publications; and, indeed, piqued by the lack of a full compliance with the cravings of its unreasonable curiosity, an "Eikon Basilike," a "Junius' Letters," or a "Vestiges of Creation," assume an importance far beyond their real worth. But for the best interests of literature: the independence of criticism, the perfect freedom of opinion, and the right of private judgment in scientific and literary as well as in theological expressions of heretical or unpopular opinions, we are inclined to believe that it is for the ultimate behoof of all, that so long as a writer chooses to publish anonymously—unless when dealing in personalities and slanders,—his right of withholding his name should be respected. The *Athenæum* may bandy words with the *Literary Gazette*, and receive its *quid pro quo*, and nobody the worse for it; but no man of good sense would willingly encourage the idea that instead of such literary abstractions, the beligerents are in reality Mr. Hepworth Dixon and Mr. Shirley Brooks. This, however, our Canadian press has yet to a great extent to learn; and nothing tends more to

lessen its influence and to curb its power, than the conscious personality which so frequently gives the tone alike to attack and reply.

More than one curious discussion has of late occupied the press at home, relative to withheld names of anonymous or pseudonymous publications. "Adam Bede," the recently published novel, is issued by Blackwood, with a name on the title which, to the ordinary reader, seems genuine enough, but those who are in the secret of the authorship of this book, which all the Reviewers have agreed to praise, must have been amused by a correspondence which has recently appeared in the *Times* regarding it. A Mr. Anders, rector of Kirkby, says the author is a Mr. Joseph Liggins, of Nuneaton, Warwickshire; and the author, under his *nomme de plume* of George Elliott, denies this point blank, adding: "Allow me to ask whether the act of publishing a book deprives a man of all claim to the courtesies usual among gentlemen? If not, the attempt to pry into what is obviously meant to be withheld—my name,—and to publish the rumours which such prying may give rise to, seems to me quite indefensible, still more so to state these rumours as ascertained truths." This is putting the question on its true grounds; and—whatever may be said in regard to editorships, or anonymous reviewing,—nothing can be more unjust, discourteous, or mean, than the attempts frequently resorted to to force the supposed author into an admission, or a refused denial of his literary offspring. In reference to the "George Elliott" impersonation, we rather hope to see the officious rector of Kirkby subjected to the penalties of a false seer, in so far as ridicule may supply a fair return for blundering impertinence. George Elliott, we strongly suspect, belongs to the same sex as George Sand, Currer Bell, and other *masculine* writers of our day.

The authorship of the "Vestiges of Creation" has of late assumed the form of a controversy scarcely less piquant than the older Junius one, or the more popular question with the last generation relative to "The Great Unknown," which tempted even "the first Gentleman of Europe" to forget his manners, in the excess of his curiosity. "We are authorized," says the *Bookseller* of December last, "to state that Mr. Robert Chambers is not the author of the 'Vestiges of Creation.'" But Mr. Robert Chambers made the same declaration some seven or eight years ago; and still the charge turns up with every new mention of that popular compendium of

Theoligico-Scientific heresy. All courtesy and gentlemanly feeling is set aside; and not only anonymous writers, but one at least who gives his name, persist in the accusation,—in his case grounded on knowledge acquired when in the confidential service of the reputed author! Certainly the "Morals of Trade" can reveal nothing worse than this. Suddenly, however, the venue is changed. George Combe, who, in a quiet, steady, unostentatious way had stuck through life to his phrenological hobby, dies at Eninburgh in a good old age; and the Cataloguers of the Museum Library—finding anonymous authors a blot on Panizzi's well-matured scheme,—father the "Vestiges" on the deceased phrenologist. Once more Mr. Robert Chambers has to decline the questionable literary honors anew thrust upon him. Then the London *Critic* comes to the defence of the British Museum Cataloguers, and re-affirms the Combe authorship, in a way that promises a *finale* to the controversy; if dogged affirmation, backed by mysterious hints of esoteric sources of information, could do it. But the controversy about the authorship of the "Vestiges" still goes on. Professor Nichol, who had been named long ago as one having some share in the responsibilities of the "Vestiges," and who revived the idea that he had a hand in the preparation of the book, by the emphatic way in which he denied Mr. George Combe's connection with it, has since met that supposition with a negative. The *Critic* reiterates its belief in Combe's authorship. It says, "We have already stated that when we attributed the authorship of the 'Vestiges' to Mr. George Combe, we did so upon the authority of one whose name is second to that of none in the world of science—perhaps we should have indicated the source of our information more clearly had we said, whose name has no equal. We are now in a position to state the grounds upon which this conclusion was arrived at by the person indicated. When the 'Vestiges' first appeared he felt satisfied, as well from the style as from internal evidence, that Combe was the author of it. To test this, he made certain corrections of a few misstatements of recondite facts, and caused those corrections to be shown to George Combe, and to him only; but when the second edition appeared, those mistakes, and those only, were found to have been corrected. This was pretty strong inferential evidence; but it so happened that afterwards a long private correspondence took place between this personage and Mr. Combe, arising out of some points mooted in the 'Vestiges,' especially phrenological ones—the former combatting

Mr. Combe's views, which were entirely in unison with those of the author of the 'Vestiges.' But what is more conclusive than all this, is the fact that during the whole of that correspondence the person to whom we have referred invariably assumed Mr. Combe to be, and addressed him as the author of the 'Vestiges,' and this was never denied, or in any way contradicted by Mr. Combe. From these facts, and from that time forth, it became a settled conviction in his mind that Mr. George Combe was the author of the 'Vestiges' —and we are not surprised at it. It is upon this authority that the Catalogue of the British Museum has been altered, and the book will now be found under the head of George Combe." The person thus mysteriously intimated as one "whose name is second to none in the world of science," is understood to be Professor Owen. But the question he thus deals with is no scientific one, and we, for one, differ from him entirely as to any internal evidence of such authorship, in the style. If Combe be the author, death, we presume, must be held to put an end to that claim of courtesy which requires us to respect such author's secret. But the denial has been made in the most explicit terms, by Mr. Robert Cox, and others best qualified to do so. George Combe is certainly not the author of the "Vestiges." Its style is not his. Neither is it that of Robert Chambers. But under the old Edinburgh theory of its authorship, it is by no means improbable that George Combe is a *vestige* of the joint *creator* of the book; as Robert Chambers has long been suspected, and Professor Nichol long believed to be.

Returning to the *Bookseller:* its Trade Gossip; Monthly Obituary; Literary and Historical Sketches; and Notices of Books: are all interesting, well got up, and show things from a new point of view. It is well that the Trade should have its literary mouthpiece, if it be for nothing else than to show the author what it thinks of him. The tailor fully believes he makes the man, though popular proverb has long required nine tailors to complete such creation. We learn now that it is the bookseller who makes the author,—for which he ought only to be too thankful, without complaining of transatlantic booksellers' reprintings, and the like processes by which the hungry author is sometimes forced into the condition to inquire, in the words of old Eliphaz the Temanite:—Should a wise man utter vain knowledge, and fill his belly with the east wind?

D. W.

Three Visits to Madagascar during the years 1853, 1854, 1856, *including a Journey to the Capital; with Notices of the Natural History of the Country, and of the present Civilization of the People.* —By the Rev. William Ellis, F. H. S., author of "Polynesian Researches." Illustrated by wood-cuts, from photographs, &c.—London: John Murray, Albemarle Street. 1858.

Among the books which have lately issued from the press, few can claim a higher degree of interest than Mr. Ellis' narrative of his visits to Madagascar; a country so long known, yet remaining so strange to the more cultivated nations of Europe and America. Populous, and possessing a certain type of civilization, with a climate favorable to the wonders and glories of vegetation; offering inviting prospects of commercial advantage not yet brought within the reach of those who desired to try their reality; and with a religious history highly obscure, yet fitted to excite an intense interest: could hardly have been visited at all, certainly could not have been visited by an intelligent and enquiring, as well as enterprising traveller, without his communications respecting it being welcomed by numbers, and his subject ensuring his success as an author. With these accidental advantages, Mr. Ellis unites the zeal, judgment, and experience which fitted him for the more weighty part of his duties, and the genuine love of nature, and careful preparation for profiting by what he observed, which must make his work attractive to the naturalist and the anxious inquirer respecting little known regions, as well as peculiarly interesting to all who desire the progress in the world of our holy faith, or can estimate and honour the firmness and devotedness of the martyr.

We cordially recommend Mr. Ellis's book to all thoughtful readers, and whilst leaving its most important parts to be studied in its own pages, we shall present a few extracts relating to scenery, manners and natural objects, which are suitable to our pages, and may afford entertainment to the reader, though removed from their context.

A MADAGASCAR DWELLING.

"The house of the harbour-master was a well constructed native dwelling, about forty feet long and between twenty and thirty feet high, with a door in the centre and a window on each side; the whole front shaded by a broad verandah, and the house thatched with

the leaves of the traveller's tree. The floor of the verandah, as well as the house, was formed of thick planks or boards neatly joined, and raised a foot and a half above the ground. The walls inside were covered with ropa cloth, and a fine large mat was spread on the floor. A neatly-made four-post bedstead, covered with fine sleeping mats, stood in one corner; choice cooking utensils in another; bags of rice and stores, with materials for making mats, and native and European weapons, occupied other parts of the dwelling. In the centre was a table of native workmanship, covered with a white cloth, on which refreshments were placed, and there were a number of chairs and native seats made of matting, like high square ottomans, in different parts of the room."

Here surely are some elements and signs of civilization. But we proceed to a passage which shows—shall we say?—an advance on some of our own countrymen, or at least equality with some of the refined ladies of a neighboring nation:

MADAGASCAR SNUFF-TAKING.

"I was much amused on this occasion, and often afterwards, with the manner in which the chiefs and people generally indulge their taste for an article resembling snuff, a native mannfacture comprising other ingredients besides the pulverised leaf of tobacco, such as salt, and the ashes of a native herb, which mixture is regularly sold in the markets. The retinue of every chief or officer of any rank, includes a bearer of what we should call his snuff-box. Those officers who attend on a superior, or are unattended by their own slaves, carry this article of luxury in some part of their dress, frequently suspended from the girdle, and concealed under the folds of their lamba; and we sometimes met a traveller with his snuff-box suspended from his neck, who seemed almost destitute of everything else except the most scanty clothing. On the occasion of our first meeting with the chief with whom we were now conversing, whenever he required the agreeable stimulus, which was tolerably frequent, the attendant slave who was usually squatted behind him, presented to him a short piece of bamboo cane, about nine inches or a foot long, and less than an inch in diameter, beautifully polished, and ornamented with rings. Into the end of this cylindrical case, a circular piece of cane or wood attached to a long tassel of silk threads was neatly fitted. When the slave had removed this ingeniously-contrived stopper or lid, the

chief took the cylinder, and shaking a small quantity, about half a tea-spoonful, into the palm of his hand, he then by a quick jerk of the hand, tossed the powder, with great dexterity, on to his tongue, without touching his lips with his hand or its contents. I do not remember ever seeing any of the natives smoking tobacco, but this use of it is universal; and though some deposit it in a different manner in the mouth, it was usually, as in this instance, jerked upon the tongue."

MADAGASCAR DRESS.

"While we were thus occupied, an officer with several attendants entered the house. He was a tall, stout man, between fifty and sixty years of age, with features resembling those of a South Sea Islander. On the upper part of his person he wore a fine figured shirt, with upright Vandyck collar, and wristbands of the same pattern, and, loosely thrown over this, a large and handsome silk scarf or lamba. The centre of the lamba consisted of broad stripes of purple, scarlet, pink, and yellow, edged with a border tastefully wrought in a kind of open work, exhibiting a curious pattern in yellow and scarlet silk. He had neither shoes nor stockings, but wore a blue cloth cap, the shade edged with silver, and the crown surrounded by a broad band of gold lace. Two of his attendants carried swords, one like a heavy cavalry weapon, the other with a straight and smaller blade."

We now turn to our author's description of one of the most curious of vegetable productions, the water yam, or lace leaf, called by botanists, from its native name,

OUVIRANDRA.

"The natives describe this plant as growing in running streams. The root or rhizome is about the size of a man's thumb in thickness, and six or nine inches long, often branching in different directions, like the roots of the ginger or turmeric, but in one continuous growth, not a succession of distinct formations attached at the termination of one and the commencement of another. The root is composed of a white fleshy substance, apparently without large or tough fibres, and is covered with a somewhat thick light-brown skin. I was informed that it also grew in places which were dry at certain seasons of the year; that the leaves then died down, but the root,

buried in the mud, retained its vitality, and when the water returned fresh leaves burst forth. The natives spoke of it as tenacious of life, and said that whenever the earth around even the smallest portion of it remained moist, that portion would put forth leaves again when covered with water. This plant is not only extremely curious, but also very valuable to the natives, who at certain seasons of the year, gather it as an article of food—the fleshy root, when cooked, yielding a farinaceous substance resembling the yam. Hence its native name *ouvirandrano*, literally, yam of the water,—*ouvi*, in the Malagasy and Polynesian languages, signifying yam, and *rano* in the former signifying water. The *ouvirandra* is not only a rare and curious, but a singularly beautiful plant, both in structure and colour. From the several crowns of the branching root growing often a foot or more deep in the water, a number of graceful leaves, nine or ten inches long, and two or three inches wide, spread out horizontally just beneath the surface of the water. The flower-stalks rise from the centre of the leaves, and the branching or forked flower is curious; but the structure of the leaf is peculiarly so, and seems like a living fibrous skeleton rather than an entire leaf. The longitudinal fibres extend in curved lines along its entire length, and are united by thread-like fibres or veins, crossing them at right angles, from side to side, at a short distance from each other. The whole leaf looks as if composed of fine tendrils, wrought after a most regular pattern, so as to resemble a piece of bright green lace, or open needlework. Each leaf rises from the crown on the root like a short delicate-looking pale green or yellow fibre, gradually unfolding its feathery-looking sides, and increasing its size as it spreads beneath the water. The leaves in their several stages of growth pass through almost every gradation of colour, from a pale yellow to a dark olive green, becoming brown or even black before they finally decay; air bubbles of considerable size frequently appearing under the full-formed and healthy leaves. It is scarcely possible to imagine any object of the kind more attractive and beautiful than a full-grown specimen of this plant, with its dark green leaves forming the limit of a circle two or three feet in diameter, and in the transparent water within that circle presenting leaves in every stage of development, both as to color and size. Nor is it the least curious to notice that these slender and fragile structures, apparently not more substantial than the gossamer and flexible as a feather, still possess a tenacity and wiriness which

allow the delicate leaf to be raised by the hand to the surface of the water without injury."

It is interesting to learn that this wonder of the vegetable creation has been safely conveyed to Europe by Mr. Ellis, and living plants placed by him at Kew, Chiswick, Regent's Park, and the Crystal Palace, so that it will become a familiar object to our countrymen. A leaf that constitutes only a frame-work to regular open spaces, being formed like a window with small panes, does at first astonish us by its novelty, but when we are informed that it grows entirely under water, reflection shows it to be still within the usual order of nature, and what might have been anticipated from consideration of the circumstances. The leaf is constructed somewhat like the lily of the valley, with straight veins meeting by a gentle curvature in the apex, and these regularly crossed by smaller veins at nearly equal distances. Did it grow in the air the inter-spaces would be filled with cellular tissue, and covered with epidermis. Water tends to prevent this growth, and thus leaves the veins like a skeleton leaf. Whoever has examined the common water crowfoot has seen the same phenomena, only there some leaves are on or above the surface of the water, which are like those of other plants, while those underneath, though filamentous, have not the same regular disposition on the meeting together of the fibres which belong to the peculiar venation of the plant. *Ouvirandra* is constantly referred to as an example of what is called a *fenestrate*, window-frame leaf, but the description of it in its native site is peculiarly interesting.

Amidst many botanical notices of an attractive character, and showing Mr. Ellis's love of nature and habit of correct observation, we will select one other—his description of

THE TRAVELLER'S TREE.

"This tree, *Urania speciosa*, is altogether one of the most remarkable that has been discovered in Madagascar, And the extent to which it prevails may be inferred from its native name, *ravinala*, by which it was designated by Sonnerat, its discoverer. Ravinala is literally, leaf of the forest, as if it was the leaf by which the forest was characterized, which is the fact where it abounds, though in many parts it is not met with at all. The tree rises from the ground with a thick succulent stem like that of the plantain, or the larger species of Strelitzia, to both of which it bears a strong resemblance. It sends

out from the centre of the stem, long broad leaves like those of the plantain, only less fragile, and rising, not round the stalk, but in two lines on opposite sides, so that as the leaves increase, and the lower ones droop at the end, or extend horizontally, the tree presents the appearance of a large open fan. When the stem rises ten or twelve feet high, the lower part of the outer covering becomes hard and dry, like the bark [a cocoa-nut tree has no *bark:* the author means the outer layer] of the cocoa-nut tree. Many of the trees in this region were at least thirty feet from the ground to the lowest leaves. I frequently counted from twenty to twenty-four leaves on a single tree, the stalk of each leaf being six or eight feet long, and the broad leaf itself four or six feet more.

"The whole of these twenty-four bright green gigantic leaves, spread out like a fan at the top of a trunk thirty feet high, presented a spectacle as impressive as it was to me rare and beautiful; and in this part of the country they were the most conspicuous objects for miles together, and were it not that these vast bright green shining leaves are slit on each side by the winds, and so flutter in smaller portions with the passing breeze, the prevalence of this tree would impart a degree of almost inconceivable magnificence to the vegetation of the country. In the fan-like head of the traveller's tree there were generally three or four branches of seed-pods. The parts of fructification seemed to be enclosed in a tough firm spathe, like those of the cocoa-nut, but the subsequent development was more like that of the fruit of the plantain. When the pods, or seed vessels, of which there were forty or fifty on each branch, were ripe, they burst open, and each pod was seen to enclose thirty or more seeds, in shape like a small bean, but enveloped in a fine silky fibre of the most brilliant blue or purple color.

"But this tree has been most celebrated for containing, even during the most arid season, a large quantity of pure fresh water, supplying to the traveller the place of wells in the desert. Whenever I enquired of the natives they always affirmed that such was the fact, and that so abundant and pure was the water, that when the men were at work near the trees, they did not take the trouble to go to the stream for water, but drew off and drank the water from the tree. Having formerly been somewhat sceptical on this point, I determined to examine some of the trees; and during my journey this morning, we stopped near a clump of the trees. One of my bearers

struck a spear four or five inches deep into the thick firm end of the stalk of the leaf, about six inches above its junction with the trunk, and on drawing it back a stream of pure clear water gushed out, about a quart of which we caught in a pitcher, and all drank of it on the spot. It was clear, cool, and perfectly sweet. On further examination I found that there was no filtration of the water through any part of the plant, as I had been led to suppose when I had seen water drawn by Sir William Hooker from one of the specimens in the palm house at Kew. There was a kind of natural cavity, or cistern, at the base of the stalk of each of the leaves, above its union with the stem, and the water which had been collected on the broad and ribbed surface of the leaf had flowed down a groove or spout on the upper side of the stalk into this natural reservoir, whence it supplied nutriment to the tree, and refreshment to the traveller and the laborer.

"But in Madagascar this tree might, with propriety, be called the *builder's tree* rather than the traveller's tree. Its leaves form the thatch of all the houses on the eastern side of the island. The stems of its leaves form the partitions, and often sides of the houses : and the hard outside bark [this tree again has no bark, but the outer layer of all endogenous trees is harder than the interior, and is sometimes confounded with the bark of exogenous trees like those of our forests,] is stripped from the inner and soft part, and having been beaten out flat, is laid for flooring; and I have seen the entire floor of a long well-built house covered entirely with its bark, each piece being at least eighteen inches wide, and twenty or thirty feet long. The leaf, when green, is used as a wrapper for packages, and keeps out the rain. Large quantities are also sold every morning in the markets, as it serves the purpose of table cloth, dishes, and plates at meals; and folded into certain forms is used instead of spoons and drinking vessels."

The magnificent and useful tree here described is well represented in the work by a wood-cut from a photograph. It belongs to the same natural family as the Strelitzia, of which several species, one of which is as large as this Urania, may be seen in English hot-houses, and the plantains and bananas which are such familiar objects in tropical countries. No plants, excepting the palms, can compare with these in the splendour of their foliage.

It seems from Mr. Ellis's observations that at least the ruling tribe

in Madagascar is of Malay origin. The prevailing cast of features may be judged of from the numerous photographs of individuals of various ranks and of both sexes. It would be easy to extract largely from this interesting volume in relation to scenery, manners, arts, the court and royal family, and more especially the interesting prince who is heir to the throne, as well as the particulars given respecting the state of the Christian converts, and the dreadful persecution they have endured. Our author's visit to South Africa in the interval of two of his Madagascar trips would also furnish matter deserving of notice, but we refer our readers to the volume itself, which will well reward perusal, and will be found as pleasing as it is instructive, so that few who open it will leave it without a complete perusal.

W. H.

Holbein's Dance of Death, exhibited in elegant Engravings on Wood, with a dissertation on the several representations of that subject. By Francis Douce, Esq., F.A.S.

Holbein's Bible Cuts, consisting of ninety illustrations on Wood, with introduction. By Thomás Frognall Dibdin. London: Henry G. Bohn, 1858.

The lists of donations to the Library of the Canadian Institute have repeatedly recorded the liberal gifts of Mr. Henry G. Bohn, of London; and from the last of these contributions we select the above volume as a curious and interesting revival of ancient art, which forms one of the series of his Illustrated Library.

Holbein's Bible cuts restore to our eyes the Bible lessons of an elder and greatly simpler age of larger and less critical faith. To such these illustrations of the sacred Scriptures were full of earnest truthfulness, while to us they frequently verge on caricature. The anachronisms in architecture, costume, furniture, &c., are often amusing enough; while the fearlesness with which the old artists grapple with the most unmanageable and recondite themes, furnishes singular illustration of the mental culture and the moral faith of the age, in which, and for which, such works of art were produced. We find such subjects as the following, handled with boldness, and wrought out in every minute detail:

"*God appeareth to Moses in a burning bush.*"

"*The fearful presence of God upon the Mount,*" a scene illustrated in various scenes of Moses' ascent of Mount Sinai: Moses figuring in all of them, as in Michael Angelo's famous statue, with horns.

"*An Angel destroyeth the Assyrian host;*" a wood-cut of singularly spirited execution.

"*The Lord said unto my Lord, sit thou at my right hand, until I make thine enemies thy footstool.*"

The visions of Isaiah, Ezekiel, and Daniel, the "Wheels within wheels," the "Four beasts," with other subjects equally profound and difficult for the pencil.

Each of the illustrations is accompanied with the fitting passage from sacred writ, in English, Latin, French, Italian, and Spanish, without any note or comment on the discrepancies sometimes noticeable in the translation. The incidents in the life of the Patriarch Job, for example, furnish the subjects of several illustrations, of which the following are the accompaniments of one:—

ENGLISH,—*Then said his wife unto him: Dost thou still retain thine integrity? Curse God and die.*

LATIN,—*Dixit autem illi uxor sua: Adhuc tu permanes in simplicitate tua? benedic Deo et morere.*

FRENCH,—*Et sa femme lui dit: Tu conserveras encore ton intégrité! Bénis Dieu, et meurs.*

ITALIAN,—*E la sua moglie gli disse, Ancora perseveri tu nella tua integrità? benedici Iddio, e muori.*

SPANISH,—*Y su muger le dixo: ¿Aun te estás tú en tu simplicidad? benedice á Dios, y muérete.*

The mere English reader will perceive the diversity between the "curse God" of the English version and the various forms of "benedicite" in the others.

Such, however, are graphic samples of the modes of simple illustration which appealed to the eye, and to the faith, of ages more primitive and frequently far more earnest in their faith than our own.

But a more curious interest attaches to the larger portion of the same volume, devoted to the art and literature of the famous "Dance Macabre," or Dance of Death.

Among the favourite devices of medieval art, by means of which the painter and the sculptor were employed to lend their aid in enforcing the lessons of morality and religion on an illiterate age, none are more worthy of notice and study than the "Dances of Death," a singular

class of ideographic moralities, executed chiefly in the 15th and 16th centuries.

This solemn and yet satirical pageant was often painted on the church-yard walls, and even in the Church itself, as at Hexham, in Northumberland, where the choir screen of the Abbey Church is adorned with a painting of the "Dance of Death," executed in the reign of Richard the Third, or early in that of his immediate successor. In other examples it is preserved in a more enduring form by means of the sculptor's art, as in the celebrated and beautiful Roslyn Chapel, near Edinburgh. Among the eccentric and bewildering variety of ornaments pertaining to that gorgeous specimen of the arts of the fifteenth century, (A. D., 1446,) the *plurima mortis imago* predominates, in some cases, with ludicrously incongruous adjuncts, but in others, with gentle and more suggestive symbols, as when flowers are seen sprouting from the empty sockets of a skull. Within the mouldings of two of the arches, or rather stone beams of the north aisle, the sculptor's allegories expand into more elaborate and coherent detail. There are two series of clustered figures in relief, the one representing the ancient allegory of "the Seven Deadly Sins," and the other "the Dance of Death."

The majority of these singular representations of death's universal sway; these

"Lessons for every heart, a Bible for all eyes,"

are replete with satirical assaults against the clergy and the priest-craft of the times; constituting in this respect an echo of the contemporary satires of the poets, just as Michael Angelo's altar-piece in the Sistine Chapel reproduces the satirical picturings of Dante's "Inferno."

Doubtless the poets in like manner reproduced the pictorial scenic moralities which appealed to their eyes, and suggested with fresh evidences the quaint incongruities of life and death which form so inexhaustible a theme for the satiric muse.

The Scottish poet Dunbar, who must have looked upon the rich devices of Roslyn Chapel when fresh from the sculptor's chisel, reproduces one of its "sermons in stone" in his "Dance of the Seven Deidly Synnis;" and it may not be thought improbable that the more popular "Dance of Death," either as represented in the Roslyn aisle, or in the same style of art, with an angel playing on the bagpipes bringing up the rear, as figured over the entrance to the cemetery of the ancient Collegiate Church of St. Giles at Edinburgh, may have

suggested much of the same poet's imagery in his "Lament for the Makars," where he pourtrays Omnipotent Death as taking

> "............. All estates,
> Princes, prelates, and potentates,
> Baith rich and poor of all degree;"

and then describes his conquests over the knight in the field, the babe at its mother's breast, the captain, the clerk, the physician,

> "The lady in bour full of beautie;" &c.

The correspondence between the scenic devices of the painter and the poet is still more obvious in the vision of Antichrist, introduced in the twenty-first passus of "Piers Ploughman's Vision." This poem, the production of an ecclesiastic, and a Wycklifite, and written somewhat earlier than the Canterbury Tales of Chaucer, abounds in satirical allusions to the excesses of the clergy. In the passage referred to, Antichrist enters, with Pride bearing his banner proudly about, and speedily hundreds crowd to follow him. The pageant is then described in a singularly vigorous passage, in which Nature sends forth diseases at the command of Conscience. The scene is pictured with a frightful vividness, and is supposed by Ellis—but without any sufficient ground,—to have suggested to Milton his sublime, though harrowing description of the Lazar-house, in B. xi. of the Paradise Lost. This loathsome procession having gone by, the poet continues his vision thus:—

> "And then met these men,
> E'er minstrels might pipe,
> And ere heralds of arms
> Haden describéd Lords,
> Eld, the hoary
> That was in the van-ward,
> And bare the banner before Death;
> By right he it claimed.
> *   *   *   *   *
> Death came driving after,
> And all to dust passed
> Kingés and Knightés,
> Kaysers and Popés,
> Leréd and Lewéd.
> He let no man stand
> That he hit even.
> Many a lovely lady
> And leman of Knightés
> Swonéd and sweltéd
> For sorrow of his dints."

The general idea of the pomp and pageantry of Death, as pictured to us in those passages of the elder poets, fully accords with the conceptions embodied in the artistic production of contemporary painters and sculptors; but the obvious derivation, not only of this general idea, but of some of the most characteristic details of the favourite medieval depiction of Death's doings, can scarcely be disputed in relation to a curious passage whlch occurs in Chaucer's Canterbury Pilgrimage.

The passage to which we refer is to be found in "The Knight's Tale," and serves to show that "the Dance of Death" was familiar to the English readers of the 14th century.

The poet there describes, in accordance with the anacronisms common alike to the poets and the painters of medieval times, the lists erected by Theseus, wherein the rivals were to contend in tourney for the hand of the fair Emely; and whosoever was fortunate enough to

> "Slay his contrary, or out of listés drive,
> Him shall I yeven Emelie to wyve."

The narrator then goes on to tell:

> "Of Theseus, that goeth so busily
> To maken up the listés really,
> That such a noble theatre as it was,
> I dare well sayn in this world there n'as.
> The circuite a milé was about,
> Walléd of stone, and ditchéd all without.
> Round was the shape, manére of a compass,
> Full of degrees the height of sixty pace,
> That when a man was set on o degree,
> He letted not his fellow for to see."

Above the gates, and in the turrets of the wall, are further constructed "oratories" or chapels, dedicated to Venus, Diana, and Mars, each decorated with appropriate carving and "portraiture," or paintings. The oratory of Venus is adorned with

> "Pleasance and hope, desire, foolhardiness,
> Beauty and youth, bauderie and riches.
> * * * * * *
> Feasts, instruments, and carols, and dances,
> Lust and array, and all the circumstances of love."

The oratory of Diana is in like manner

> "Depeinted by the wallés up and down,
> Of hunting and of shamefaced chastitie."

While for the "Temple of mighty Mars," the poet fitly selects "the Dance of Death" as its most appropriate decoration. The thoroughly medieval sources from whence alone Chaucer borrowed this latter theme, become the more apparent from their contrast with the classical figures of Narcissus, Medea, Hercules, Circe, Cræsus; and again of Danæ, Actæon, Meleager, Atalanta, &c., with which the temples of the Goddesses are adorned; though "*The folie of King Solomon*" is not omitted among the reminisences of the amorous goddess. After the description of that of Venus:

> "The noble kerving, and the portreitures,
> The shape, the countenance of the figures
> That weren in the oratorie."

The Knight thus proceeds with his tale:

> Why should I not eke, as well, tell you all
> The portraiture that was upon the wall,
> Within the temple of mighty Mars the red?
> All painted was the wall in length and bread,
> Like to the estres of the grisly place
> That hyght the great temple of Mars in Thrace,
> In the ilk northern frosty region
> Where as Mars hath his sovereign mansion.
>
> First on the wall was painted a forest
> In which there dwelleth neither man nor beast;
> * * * * * *
> There saw I first the dark imagining
> Of FELONY, and all the compassing;
> The cruel IRE, red as any gled,
> The PICKPURSE and eke the palé DREAD;
> The SMILER with the knife under the cloak,
> The shipping burning with the blacké smoke.
> The TREASON of the murdering in the bed;
> The open war, with woundes all bebled,
> CONTEKE with bloody knife and sharp menace:
> All full of chirking was that sorry place.
> The slayer of himself, yet saw I there,
> His heartes blood had bathéd all his hair;
> The nail ydriven in the shode on hight;
> The coldé death with mouth gaping upright.
>
> Amiddes of the temple sat MISCHANCE,
> With di'scomfort and sorry countenance.
> Yet saw I MADNESS laughing in his rage,
> Armed COMPLAINT, OUTCRIES, and fierce OUTRAGE;

The carrion in the bush, with throat ycorve,
A thousand slain and not of qualme ystorve;
The tyrant with the prey by force yreft,
The town destroyéd, there was nothing left.
There saw I burnt the shipés hopésteres,
The hunter strangled with the wildé bears;
The Sow freting the child right in the cradle;
The Cook yscalded, for all hi's long ladle.
Nought was forgot by the infortune of Mart;
The Carter over-ridden with his cart,
Under the wheel full low he lay adown."

Many of the scenes and characters depicted by the poet,—including some of those which appear the least poetical among the figures introduced,—are directly borrowed from familiar allegorical paintings, in examples of the "Dance of Death" which have been preserved; and are no doubt derived from some well known picture of the time, which the poet knew to be familiar to his readers. Several of them are reproduced among the curious wood-cuts of Mr. Bohn's publication. There was a famous representation of this ancient suggestive Morality, on the cloister walls of old St. Paul's, London, and if that existed, as is by no means improbable, in the time of Chaucer, its mortal pageantry would be readily recognised by his readers.

Stowe tells us, in his "Survey of London," printed in 1618, that there was a great cloister on the north side of St. Paul's Church, surrounding a plot of ground, known of old as Pardon Churchyard. He then states that about this cloister was artificially and richly painted the Dance of Machabray, or Dance of Death, commonly called the Dance of Paul's; the like whereof was painted about St. Innocent's cloister at Paris. The metres or poesie of this Dance were translated from French into English, by John Lydgate, Monk of Bury; the picture of Death leading all estates being executed at the expense of Jenkin Carpenter, in the reign of Henry VI. Again we learn from the same authority, of the destruction of this curious relic of Medieval Art. "On the 10th of April, 1549, the cloister of St. Paul's Church, called Pardon Churchyard, with the Dance of Death, commonly called the Dance of Paul's, about the same cloister, costly and cunningly wrought, and the chapel in the midst of the same churchyard, were all begun to be pulled down." This destruction was the work, as we learn, of the Protector Somerset, in order to obtain materials for building his own palace in the Strand.

The poem of Chaucer's immediate successor, Lydgate, referred to by Stowe, entitled "The Dance of Death," is affirmed by Warton to have been translated from the French at the request of the Chapter of St. Paul's, for the purpose of being inscribed under the painting in the cloister; but it is stated by the poet himself to have been rendered: "not word by word, but following in substance," and was doubtless adapted to the details of the painting it was designed to accompany, in so far as that differed from the celebrated depiction of the ancient morality on the walls of St. Innocent's Cloister at Paris; with its French version of the older lines, derived as some suppose from a still earlier German original.

The *Thief*, or *Pickpurse*, the *Cook*, the *Waggoner*, the *Child in its Cradel*, and others of the series figured by Chaucer in the "Knight's Tale," are all familiarly known to those who have had opportunities of examining the ancient representations of the pictured pageant of Death; or who have studied the learned dissertations of the antiquary Douce—now reprinted in this more popular form,—on the origin and characteristics of this obscure subject of Medieval Art.

Instead of a critical review of a text already well known, at least to the antiquary, we prefer availing ourselves, in this article, of the opportunity it affords of drawing the reader's attention to some curious or interesting passages, illustrating the subject of Douce's elaborate investigation.

In one of the most beautiful of Chaucer's minor poems, "The Romaunt of the Rose." The allegory is represented under the same figure of a series of paintings on a wall:

> "When I had a while ygone,
> I saw a garden right anon,
> Full long and broad, and everidele
> Enclosed was, and walled well,
> With high walls embatailed,
> Pourtrayed without, and well entayled
> With many riche portraitures;
> And both the images and peintures
> Gan I behold busily,
> And I will tell you readily
> Of thilke images the semblance,
> As far as I have remembrance."

The allegory is not in this, as in "The Knight's Tale" borrowed from the medieval paintings and sculptures referred to; but there are

sufficient elements of comparison traceable between them, to render it most probable that the mode of treatment and even some of the details were suggested by the contemporary pictured "Moralities," familiar alike to the poet and his readers. "Hate," "Felony," "Villany," "Covetice," "Avarice," "Envy" and "Sorrow" are all successively described, after which comes "Elde," the same that is introduced in Pier's Plowman as the Standard-bearer of Death. After the description of Elde's portraiture, the following beautiful passage on the fleeting nature of time occurs:

"The time that passeth night and day,
And restlesse travayleth aye,
And stealeth from us so privily,
That to us seemeth sikerly
That it in one point dwelleth ever,
And certes it ne resteth never,
But goeth so fast and passeth aye,
That there n'is man that thinké may
What time that now present is,
Asketh at these clerkis this,
For men think it readily
Three times been passed by
The time that may not sojourn
But goeth and may never return,
As water that down runneth aye
But never drop returné may.
There may nothing as time endure,
Metal, nor earthly creature,
For all thing it fret and shall,
The time eke that changeth all;
And all doth wax, and fostered be,
And all things destroyeth he.

The time that eldeth our ancestors
And eldeth Kings and Emperors,
And that us all shall overcommen
Ere that death us shall have nomen;
The time that hath all in welde
To elden folk, had made her elde
So inly, that to my witing
She might help herself nothing,
But turned ayen unto childhede;
Ne wit, ne pithe in her hold
More than a child of two year old."*

The subject which receives those illustrations in the pages of our early English Poets, lies—as might be expected,—extremely remote from all the ideas and associations of this new world, carrying the fancy back into dim old centuries, with their archaic thoughts, suggestive picturings and quaint moralities for the instruction of an unlettered age. Yet Death leads us all the same dance in this new world as in the old, and in this most modern century as in all that went before it; and the old world theme of "The Dance of Death" has been handled—if the last, not the least beautifully,—by one of America's living poets, in "The Golden Legend," of Longfellow.

The scene lies on the road to Italy, whither Prince Henry and Elsie are travelling in company, and on reaching a covered bridge at Lucerne, the following dialogue ensues:

P. HENRY. "God's blessing on the Architects who built
The bridges o'er swift rivers and abysses
Before impassable to human feet,
No less than on the builders of Cathedrals,
Whose massive walls are bridges thrown across
The dark and terrible abyss of death.
Well has the name of Pontifex been given
Unto the Church's head, as the chief builder
And architect of the invisible bridge
That leads from earth to heaven.
ELSIE. How dark it grows!
What are these paintings on the walls around us?
P. HENRY. The Dance Macabre!
ELSIE. What?
P. HENRY. The Dance of Death!
All that go to and fro must look upon it,
Mindful of what they shall be, while beneath,
Among the wooden piles, the turbulent river
Rushes, impetuous as the river of life,
With dimpling eddies, ever green and bright,
Save where the shadow of this bridge falls on it.
ELSIE. O, yes! I see it now!
P. HENRY. The grim musician
Leads all men through the mazes of that dance,
To different sounds in different measures moving;
Sometimes he plays a lute, sometimes a drum,
To tempt or terrify.
ELSIE. What is this picture?
P. HENRY. It is a young man singing to a nun,
Who kneels at her devotions, but, in kneeling,

Turns round to look at him; and Death, meanwhile,
Is putting out the candles on the altar!

ELSIE. Ah, what a pity 'tis that she should listen
Unto such songs, when in her orisons
She might have heard in heaven the angels singing.

The subjects thus gracefully rendered by the poet, appear among the wood cuts ascribed to Holbein; and Douce remarks, in his elaborate dissertation: "We find the Dance of Death often represented, not only on the walls, but in the windows of churches, in the cloisters of monasteries, and even on bridges, especially in Germany and Switzerland." Here is the modern prose comment, in the work under review, on the subject so beautifully rendered in Longfellow's verse. It illustrates the motto: *Est via quæ videtur homini justa: novissima autem ejus deducunt hominem ad mortem.* Proverb, iv. The woodcut is entitled THE NUN; and the editor remarks: "Here is a mixture of gallantry and religion. The young lady has admitted her lover into her apartment. She is kneeling before an altar, and hesitates whether to persist in her devotions, or listen to the amorous music of the young man, who, seated on a bed, touches a theorbo lute. Death extinguishes the candles on the altar, by which the designer of the subject probably intimates the punishment of unlawful love." We doubt, however, the necessity of the concluding remark. The idea is sufficiently accordant with the general theme of the old pictorial moralist, that Death claims all seasons for his own; and the hour of devotion is alike his, with that of the lover's interview, or of the wandering thoughts of the youthful devotee, divided in thought between this world and the next. But, like the older Bible illustrations, that which embodied only grave and solemn lessons for simpler ages, is more apt to excite ludicrous thoughts in the modern student's mind; and where the ancient "Dance of Death" has not already been defaced or obliterated, it owes its preservation far more to the archæological zeal, than to the pious reverence of modern ages.

D. W.

SCIENTIFIC AND LITERARY NOTES.

PHYSIOLOGY AND NATURAL HISTORY.

ACCIDENTAL FERTILIZATION OF PAPILIONACEOUS PLANTS.

We extract from the correspondence in a recent number of the *Gardener's Journal*, the following observations on accidental fertilization, furnished by a correspondent signing himself J. B. W., and corroborating, from his own experience, statements contained in a previous communication on this subject, by Wm. Darwin. I am in the habit, he observes, of growing the Black Belgian Kidney Bean (Haricot d'Algiers) and a small seeded white Haricot side by side with the common Scarlet Runner, and I find a great tendency to seminal variation in the two first-named, but none in the Scarlet Runner except a slight variation in the color of the seeds, which is probably not greater than would occur if that variety was grown alone. When I first obtained from the Horticultural Society the very distinct kind known as the Black Belgian, its seeds were of a jet black color, and the pods they produced were of a creamy white, and much more fleshy than those of the common Runner. I find, however, every year many pods that are thinner in substance and almost green in color, while the seeds they contain are not black but darker or lighter slate color, so that it is only by making a selection of seeds that I am enabled to keep the sort true. I imagine that this variation must be caused by cross impregnation with the White Haricot, although that plant is so different in appearance from the black one that many botanists would certainly make them distinct species. The seeds of the small Haricot ought to be pure white, but there are always some among them of a pale dun color which are picked out and thrown away, so that I have no notion of what they would produce if sown. It is well known to gardeners, that the dwarf varieties of Kidney Bean are extremely liable to cross when two or more sorts are grown side by side, although some strongly-marked varieties, such as the Newington Wonder, are less readily affected by foreign influence. With regard to Peas, I think it certain that some at least of the new varieties which are annually sold at high prices to a confiding public, are the result of accidental cross impregnation; and yet such crosses cannot be of frequent occurrence, for I have grown both the Auvergne Pea and the Champion of England intermixed with other kinds during several years, and they are still perfectly true. It is well known that many of the most valuable varieties of the Brassica tribe of vegetables have been originated by hybridization, and the facility with which they cross, many a poor gardener discovers to his sorrow when his "Unapproachable" Cabbage, or his "Unmatchable" Broccoli, has been hopelessly spoiled by intermixture with the vile "Greens" of his slovenly neighbor. I have heard it said, however, that none of the culinary Cabbages will cross with the Turnip, which is a very curious thing if true.

INFLUENCE OF THE MOON'S LIGHT UPON PLANTS.

We borrow from the *Annals of Natural History*, the following observations by Professor Zantedeschi, of Venice, on a subject which has of late attracted considerable attention, and led to much diversity of opinion:

The Abbé Tessier having made a great number of experiments upon etiolated plants, which had become white or yellow from being kept in the dark, observed that those exposed to the light of the moon, and kept in the dark during the day, were evidently less yellow or white than those kept in the dark day and night.

The Abbé Antonio-Maria Vassalli, Professor of Physics at Turin, relates that the Sensitive Plant is susceptible of the influence of moonlight. "Having," he says, "procured some sprouted seeds of the Sensitive Plant, 12 days after their germination I transplanted them into earth contained in glass bottles, and into other vessels filled with earth.

"I observed that their sleep had a regular periodicity. Exposed to the east two hours before sunrise, their leaves, which were perfectly closed at 1 A. M., began to open at dawn, and unfolded completely some little time after sunrise, more or less quickly according to the state of the air. If they are carried during the day into a dark place, or covered with an opaque vessel, the leaves close, but not so exactly as during the night. Exposed afresh to the light, they open again slowly. In making these observations I was careful to shake all the pots equally, without covering them, in carrying them, in order that the variations might not be attributed to these shocks. After repeating the various observations, for greater certainty, I exposed the pots to the light of the moon.

"I did not remark any variation in the leaves when the exposure, commencing at 1 A. M., had lasted one hour; but after three hours the leaves were less closed though still not open.

"Having one evening exposed the pots to the rays of the moon until midnight, when the leaves were not completely closed, I found them very well opened about 1 A. M.

"I attempted to arrange a lens so that its focus should fall on a closed leaf; but I could not detect any variation in the short space of time during which the light of the moon was condensed." (Opuscoli scelti di Milano, 1794.)

These observations have been renewed in our own time on Vetches, by Prof. G. Giulj; he caused Vetches to germinate and spring up in a cellar entirely shut up from the light both of the sun and moon; and the little plants were very white. Some of them were exposed for several nights to the action of the moon's rays, while others, also in full growth, were kept in complete darkness: the former acquired a green colour like that of the same plants exposed in the open air, and even to the sunlight; those, on the contrary, kept constantly protected from the light of the sun and moon were not at all coloured, and ultimately rotted. More than this: Prof. Giulj ascertained by direct experiment that the light of the moon falling upon certain plants, or certain leaves, has the property of causing the liberation of oxygen (Dei Lavori della Reale Accadem. delle Scienze, 1844).

I have successfully repeated the experiments of Tessier and Giulj on the power possessed by the rays of the moon in developing the colors of the leaves of plants, and I took the greatest precautions to maintain the pots in all the conditions which

were necessary to avoid the objections which might be founded upon the influence of humidity or any other atmospheric variation. They were kept in the dark during the whole day; when the days preceding the full moon arrived, they were carried, after 3 A. M., always to the same place to be exposed to its rays: but two of the pots were uncovered, and two protected from the rays by an opaque body; the others were freely exposed to the open air and all its influence.

After six nights' exposure, the difference in the coloration was very marked: the little plants constantly protected from the influence of light were white; and those exposed to the lunar rays had a yellowish tint, which appeared to be changing to the green colour.

I desired to repeat also the experiment of Vassalli. I had only made observations upon leaves perfectly closed, and little shoots, of no vigour, drooping over the edges of the pots wherein they had germinated. After that, I tried exposing various specimens of Mimosa pudica to the action of the moon's rays for an hour during full moon. I was delighted to see the little shoots rise after a quarter of an hour's exposure; the plants were at the distance of a few millemetres from the edge of the pot; in half an hour the stems were straighter, and in an hour and a half they had attained the height of more than 2 inches; but I could not detect any sensible opening of the leaves. This experiment appeared necessary in order to confirm what has been said of the influence of the rays of the moon upon the growth of the Mimosa, because this fact, more or less established by Vassalli, has not been received with entire confidence by other authors; and in this last experiment I took precaution of placing near the Mimosa exposed to the lunar rays another of the same plants covered with an opaque body, which shielded it from the light: in this no movement was produced. The experiment was repeated six times with constant results. We may therefore believe that the growth of the little stems of the Mimosa is to be attributed solely to the influence of the moon's rays.

I made these experiments in the summer of 1847; and I have thought it necessary to enter into details, because I was able to make certain, by a great number of observations, frequently repeated, that the difference of temperature, of the movement of the air, and exposure to different degrees of light, had an influence upon the more or less prompt and more or less perfect manner in which the leaves of the Mimosa open and close.

One morning in the month of July, about 5 o'clock, in the Botanic Garden of Venice, two plants of Mimosa pudica, kept in a conservatory (perfectly expanded), presented an aspect of luxuriant vegetation. Another, exposed in the open air, had its leaves entirely closed and the stems bent. A fourth, placed in another part of the garden was half-closed. On the day preceding, the gardener had, at my orders, shut up the last in a dark place three hours before sunrise.

I took care also to verify the influence exerted upon the Mimosa by the artificial light of a lamp, and I found the growth was from 3 to 5 centimetres.

CARPENTERIA AND DUJARDINIA.

The number of the *Annals of Natural History* for November, contains an interesting communication from Dr. J. E. Gray of the British Museum, on the discovery of an animal forming a connecting link between Rhizopoda (Foraminifera) and

Porifera or sponges. The specimens examined by Dr. Gray had been supposed to be Cirrhopoda, allied to Balanus. Minute examination satisfied him that this was a mistake, and at length led to the conviction that he had obtained a new form of Protozoa, occupying the position indicated above. This ingenious conjecture being sanctioned by Professor Busk and Dr. Carpenter, is now given to the world, and the two genera which Dr. Gray feels authorized to establish are named *Carpenteria* and *Dujardinia*, in honor of two of the most eminent observers of the allied forms, Dr. W. B. Carpenter, and Professor Felix Dujardin, of Rennes.

W. H.

ETHNOLOGY.

At the Montreal meeting of the American Association for the Advancement of Science, Lewis H. Morgan, Esq., of Rochester, N.Y., communicated some of the results of a curious investigation pursued by him, relative to the laws of consanguinity and descent of the Iroquois. Further investigation induces him to believe that the system traced out by him, in relation to one of the most important of the aboriginal nations of this continent, is by no means confined to them; but, on the contrary, it embraces such wide ramifications as to furnish a means of no slight value for tracing the connection between the Indians of America and any Asiatic or other tribes or nations of a common origin.

Following ont the scheme of investigation thus indicated, Mr. Morgan sets forth his views in a letter, of which the following abstract embraces the most significant suggestions:—

"It has occurred to me, after a careful examination of the system of consanguinity and descent of the Iroquois, that we may yet be able, by means of it, to solve the question whether our Indian races are of Asiatic origin. Language changes its vocabulary not only, but also modifies its grammatical structure in the progress of ages; thus eluding the inquiries which philologists have pressed it to answer; but a system of consanguinity once matured and brought into working operation, is, in the nature of things, more unchangeable than language;—not in the names employed as a vocabulary of relationship, but in the ideas which underlie the system itself. The Indo-European nations have one system, identical in its principal features, with an antiquity of thirty-five centuries, as a fact of actual record. That of the Iroquois is original, clearly defined, and the reverse of the former. It is, at least, to be presumed that it has an antiquity coeval with the race. That of the Chippewa is the same as the Iroquois, with slight modifications; thus establishing the fact of its existence in two of the principal generic stocks. Besides this, there are traces of the same system among the Aztecs, Mohaves, Creeks, Dahcotas, Delawares, Winnebagoes, and other races, all tending to show that the system has been, and now is, universal upon this continent. Should this last fact be established, the antiquity of the system, as coeval with the Indian race upon the continent, will also become established. Upon the basis of these two facts, and assuming that these races are of Asiatic origin, we may predict the existence of the same system in Asia, at the present moment, among the descendants of their common ancestors, if any remain.

"A brief explanation of the principal features of the system of the Iroquois is annexed, which will assist in working out every other, particularly if they are founded upon the same ideas.

"The institutions of the Iroquois were founded upon the family relationships; in fact, their celebrated league was but an elaboration of these relationships into a complex system of civil polity. At the base of this were their laws of descent. They were unlike both the civil and the canon law; but yet were original and well difined. The chief differences were two: first descent among the Iroquois followed the female line, or passed through the mother; while in each of the former systems it follows the male, or passes through the father. In the second place the collateral lines, with the Iroquois, were finally brought into or merged in the lineal; while, in the other cases, every remove from the common ancestor separated the collateral lines from the lineal, until after a few generations actual relationship ceased among collaterals.

"To bring out distinctly this code of descent, it will be necessary to give a brief explanation of the division of the Iroquois into tribes, the union of the several tribes into one nation, and of the several nations into one league. Without a reference to their civil organization, it would be impossible to present it in an understandable form.

"In each of the five nations who composed the original league, there were eight tribes, named: Wolf, Bear, Beaver, and Turtle; Deer, Snipe, Heron, and Hawk. The Onondaga nation, therefore, was a counterpart of the Cayuga, each having the same number of tribes, and of the same name; so also, interchangeably, of the Oneida, the Mohawk, and the Seneca nations. In effect, the Wolf tribe was divided into five parts, and one-fifth part of it placed in each of the five nations. The remaining tribes were subjected to the same division and distribution. Between the individual members of the Wolf or other tribe thus divided, or, in other words, between the separated parts of each tribe, there existed the tie of consanguinity. The Mohawk of the Turtle tribe recognized the Seneca of the Turtle tribe as a relative, and between them existed the bond of kindred blood. In like manner the Oneida of the Hawk tribe received the Onondaga or the Cayuga of the same tribe as a relative, not in an ideal or conventional sense, but as actually connected with him by the ties of consanguinity. Herein we discover an element of union between the five nations, of remarkable vitality and power. A cross-relationship existed between the several tribes of each nation and the tribes of corresponding name in each of the other nations, which bound them together in the league with indissoluble bonds. If either of the nations had wished to cast off the alliance, it would have broken this eight-fold bond of consanguinity. Had the nations fallen into collision with each other, it would have brought Hawk tribe against Hawk tribe—in a word, brother against brother. The history of the Iroquois exhibits the wisdom of these organic provisions; for, during the long period through which the league subsisted, they never fell into anarchy, nor even approximated to a dissolution from internal disorders.

"At no time in the history of the Iroquois could a man marry a woman of his own tribe, even in another nation. All the members of a tribe were within the prohibited degrees of consanguinity; and to this day, among the descendants of

the Iroquois, this law is religiously observed. Husband and wife, therefore, were in every case of different tribes. The children were of the tribe of the mother. Here, then, we discover one of the central ideas of their laws of descent: to place the father and mother in different tribes, and to assign the children to the tribe of the mother. Several important results followed, of which the most remarkable was, the perpetual disinheritance of the male line. As all titles, as well as property, descended in the female line, and were hereditary in the tribe, the son could never succeed to his father's title of sachem, nor inherit even his tomahawk.

"A tribe of the Iroquois, it thus appears, was not, like the Grecian and Roman tribes, a circle or group of families, for two tribes were necessarily represented in every family; neither, like the Jewish, was it constituted of the lineal descendants of a common father; on the contrary, it involved the idea of descent from a common mother; nor has it any resemblance to the Scottish clan, or to the canton of the Switzer. It approaches, however, nearest to the Jewish. Denying geographical boundaries, a tribe of the Iroquois was composed of a part of a multitude of families, as wide spread as the territories of the race, but yet united together by a common tribal bond. The mother, her children, and the descendants of her daughters, in the female line, would, in perpetuity, be linked with the fortunes of her own tribe; while the father, his brothers and sisters, and the descendants in the female line of his sisters would be united to another tribe, and held by its affinities. No circumstances could work a translation from one tribe to another, or even suspend the nationality of the individual. If a Cayuga woman of the Hawk tribe married a Seneca, her children were of the Hawk tribe and Cayugas and her descendants in the female line, to the latest posterity, continued to be Cayugas and of the Hawk tribe, although they resided with the Senecas, and by successive intermarriage with them had lost nearly every particle of Cayuga blood. Neither could intermarriage with one of a foreign nation confer the Iroquois nationality upon the wife or children of the marriage, and the same *vice versa*. If a Mohawk married a Delaware woman, she and her children were not only Delawares still, but ever continued aliens, unless naturalized as Mohawks, with the forms and ceremonies prescribed in case of adoption.

"Such property as they possessed, as planting lots, orchards, articles of apparel, etc., descended in the female line; that is to say, the wife and children took nothing from the father and husband, as they were of another tribe, except it was given to them by the deceased before his death, in the presence of witnesses. The property went to the brothers and sisters of the deceased, or to the children of the sisters. The property of husband and wife was kept distinct during the marriage, and held by separate ownership; and upon the death of the mother, her property was inherited by her children. Usually, planting lots, orchards, etc., belonged to the female. In case of divorce, each took their separate effects. The children belonged to the mother, and the authority and control of the father over them ceased from the moment of separation.

"The next feature of importance in their system of descent was the breaking up of the collateral line, by merging it in the lineal, whereby the number of those who were bound together by the nearer family ties was largely multiplied. In

three removes from the common ancestor, in most cases, and in four, absolutely, this result was effected. It was accomplished by bringing the degrees of relationship nearer to each other than they are in the civil or the canon law. Thus a mother and her sisters stood equally in the relation of mothers to the children of each other; the grandmother and her sisters were equally grandmothers, the father and his brothers were fathers, the grandfather and his brothers were grandfathers to the children of each other, and so up in the ascending series. The children of two sisters were the children equally of each other, and the grandchildren of the one were the grandchildren of the other, and so down in the descending series. On the side of two brothers the degrees were reckoned in the same manner. A difference, however, was made between the children of a brother and the children of a sister, in their relationship to each other. Thus the children of two sisters were brothers and sisters to each other; they were all of the same tribe. So also were the children of two brothers, although they might be of different tribes. But the children of a brother and the children of a sister were cousis, as in the civil law; they were necessarily of different tribes. The sister was aunt to the brother's children, and the brother was uncle to the sister's, and the children of these nephews and nieces were the grandchildren equally of each. Again, the cousins themselves were interchangeably either uncles and aunts, or fathers and mothers, to the children of each other, and grandfathers and grandmothers to their children. By this simple process of reckoning degrees, the subdivision of a family into collateral branches was rendered impossible. A cousin who stands in the fourth degree of the civil law was the most remote collateral recognized in their code of descent, or rather, allowed from the lineal line.

"The grandchildren of the two sisters were also brothers and sisters to each other; and the descendants of two sisters standing in equal degrees from their respective ancestral heads, continued to be brothers and sisters to the remotest generation. The name of the relationship was changed from brother and sister to a descriptive term; but yet they recognized each other as brother and sister. With the descendants of two brothers the rule was the same. But the descendants of a brother and the descendents of a sister continued in like manner to be cousins; this last degree being as far asunder as it was possible for the descendants of brothers and sisters to fall, under the system of the Iroquois. In case one was farther removed from the ancestral head than the other, the rule which changed the collateral into the lineal line at once applied; thus the son of the son of my father's sister, or my cousin's son, becomes my nephew, and the son of this nephew becomes my grandson. In like manner, the son of the son of my mother's sister becomes my nephew, although his father was my brother. For this last result, the reason is apparent—this nephew is necessarily out of my tribe; but the reason for the same rule in the case of a cousin's son is not apparent. For example:

Description of Relationship.			Name in Seneca Iroquois.	Same in English.
My father's sister's son,			*Ah-gare'-seh,*	Cousin.
do	do	son's wife,	*Ah-ge-ah'-ne ä,*	Sister-in-law.
do	do	daughter,	*Ah-gare'-seh,*	Cousin.
do	do	daughter's husband,	*Ha-ya'-o,*	Brother-in-law.

Description of Relationship.			Name in Seneca Iroquois,	Same in English.
My father's sister's son's son,			*Ha-soh'-neh*,	Nephew.
do	do	son's daughter,	*Ka-soh'-neh*,	Niece.
do	do	daughter's son,	*Ha-ah'-wuk*,	Son.
do	do	daughter's daughter,	*Ka-ah'-wuk*,	Daughter.
do	do	great-grandson,	*Ha-yä'-da*,	Grandson.
do	do	great-granddaughter,	*Ka-yä'-da*,	Granddaughter.
My mother's sister's son,			*Hä'-je*, (if older,) *Ka'-ga*, (if younger,)	Older brother, or Younger brother.
do	do	daughter,	*Ah'-ye*, (if older,) *Ka'-ga*, (if younger,)	Older sister, or Younger sister.
do	do	son's son,	*Ha-soh'-neh*,	Nephew.
do	do	son's daughter,	*Ka-soh'-neh*,	Niece.
do	do	daughter's son,	*Ha-ah'-wuk*,	Son.
do	do	daughter's daughter,	*Ka-ah'-wuk*,	Daughter.
do	do	great-grandson,	*Ha-yä'-da*,	Grandson.
do	do	great-granddaughter,	*Ka-yä'-da*,	Granddaughter.

"To render these degrees of relationship intelligible, it must be remembered, that a part only of the kindred of an individual were of the same tribe with himself. Thus, Sa-go-ye-wat-hä, or Red Jacket, was of the *Turtle* tribe of the Seneca nation. His brothers and sisters, his mother and her brothers and sisters, and his maternal grandmother and her brothers and sisters, were necessarily of the Turtle tribe; so also were the children of his sisters, and thus down through the female line. But his father, and his brothers and sisters, and his paternal grandfather, and his brothers and sisters, would be of a different, and might be of several different, tribes; so, also, his sons, and the children of his sons, would be of a different tribe, unless these sons should marry back into the Turtle tribe, against which there was no prohibition.

These laws of descent were not confined to a special class, but were of universal application; and to this day, among the descendants of the ancient Iroquois, they are preserved and recognized unchanged, and are as familiar to the rudest Indian as the alphabet is to us.

To understand the practical use of this code of descent in its most important relation, namely, the descent of the title of sachem, it will be necessary to examine briefly the structure of the League of the Iroquois. At the institution of the league, fifty permanent sachemships or hereditary titles were created and named. They were then distributed among the nations as follows: nine of them were assigned to the Mohawk, nine to the Oneida, fourteen to the Onondaga, ten to the Cayuga, and eight to the Seneca nation. These titles were made hereditary in certain tribes, some of which received two or more, and others none. These sachemships could never pass out of the tribe to which they belonged, except with its extinction. While the office of sachem was absolutely hereditary in the tribe, it was, at the same time, elective as between certain of the male relatives of the deceased sachem of the same tribe with himself.

"The title of sachem was surrounded by insuperable barriers against the designs

of talented and ambitious men, for reasons of policy; and the safeguards against usurpation were too deeply integrated in their institutions to be overcome or superceded. How this was accomplished was, for a long period, difficult to be understood; but the intricacy is removed by the single fact, before stated, that the title was hereditary in the tribe, but elective as between certain of the male relatives of the deceased sachem. It will not be necessary to explain minutely how the choice was made, further than to say, that, if the title belonged to the Wolf tribe, the new sachem must be "raised up," to use their own expression, from the same tribe. As the son of the sachem was of another tribe, he was out of the line of succession; but his brothers were of the Wolf tribe, and so were his sister's sons; hence we find that the succession fell upon a brother of the deceased ruler, or upon a nephew. Between a brother of the deceased and the son of a sister there was no law establishing a preference; neither as between several brothers on one side, or several sons of a sister on the other, was there any law of primogeniture. They were all equally eligible, and the law of election came in to decide between them. The choice was made by the wise men and matrons of the tribe; and among the latter the mother of the deceased ruler exercised a decisive influence.

Upon the decease of a sachem, and the choice of a successor, a council of all the Sachems of the League was convened to "raise up" the new ruler, and invest him with his title. To this council belonged the exclusive power of investing with the office; and no one could become a sachem in fact, until this ceremony of investiture was performed. These councils lasted several days, and were attended with many forms and ceremonies. They are still held in Western New York as often as each alternate year.

"These sachems were the rulers of the people, partly by elective, and partly by hereditary right; but their duties and authority were confined exclusively to the affairs of peace. When assembled together, they formed the general council of the league, and possessed, in themselves, the executive, legislative, and judicial powers of the Commonwealth. In the same manner the several sachems of each nation composed the national council, which exercised a separate government over all the affairs of their respective nations, such as did not relate to the general welfare.

"Many years after the formation of the league, a new office was created—the office or title of *chief*. It was of lower rank than that of sachem, and was not hereditary. It was in the strict sense elective, and the reward of merit, and ceased with the life of the individual. To this class the most distinguished of the war captains and orators of the Iroquois belonged; among them, Tă-yen-dă-nae-ga, or Joseph Brant, and Sa-go-ye-wat-ha, or Red Jacket. At the present time the Seneca nation, in Western New York, have eight sachems, as of old, who hold their titles by the original tenure, and about seventy chiefs, who hold by election.

"It is an interesting fact, that the sachems of the Iroquois at the present day, although the league is dismembered, and the nations are scattered, still bear the same individual names which were borne by their predecessors at the establishment of the league. Thus Ho-no-we-na-to, which means "Keeper of the Wam-

pum," was the name given to one of the fourteen original Onondaga sachems. All of his successors, through many generations, down to the present Ho-no-we-na-to, now at Onondaga, have held the same title, and borne the same name. Do-ne-ho-gä-weh, the "Keeper of the Door," was the name of one of the eight original Seneca sachems. This title, in like manner, has been held by all of his successors, down to the present day. Ely S. Parker, an educated Seneca, at the present time in the civil service of the United States, now holds this sachemship. When he was raised up, a few years since, his former name, Hä-seh-no-an-da, was "taken away," to use again their mode of expression, and the name Do-ne-ho-gä-weh bestowed in its place, by which alone he is now known. The office of sachem, therefore, is a title of nobility, but descending in the female line, instead of the male, and having attached to it the authority and powers of an hereditary ruler of the Iroquois."

Having thus set forth the Iroquois laws of descent, and the singular polity based upon them, Mr. Morgan proceeds to show in what ways it may aid as an instrument towards solving the great problem of the origin of the Indian races of this continent. Believing in the inevitable permanency of the primary institutions of a people, unless under the influence of such a revolution as the transmutation of the wild hunter-tribe into a civilized community. Mr. Morgan conceives that he has thus mastered the fundamental element of Indian society; and he is now in search of the same, or some corresponding social elements, along the supposed Asiatic path of migration to the New World.

"Nearly all of our Indian races," he observes, "are divided into tribes. The theory of the tribe is, that all of its members are consanguinii. It is a method of preserving, under a general name, the relationship which subsists among them. But since several tribes are united in one nation, and these are mingled by intermarriage, a system of relationship was still necessary to render definite the kindred ties. Among the European races, as we have seen, every remove from the common ancestor separated the collateral lines farther and farther, until, after a few generations, relationship ceased—terminating in a total dispersion of blood, except as it was preserved by the national tie. With the Iroquois it was the reverse. By merging the collateral lines in the lineal, the integrity of the bond of kindred blood was maintained, in a sensible form, through all generations. A confusion of kindred would appear to be inevitable; but in practice it was otherwise, as is demonstrated by the fact, that it is at the present moment a practical working system, perfectly and readily understood.

"Descent in the female line does not appear to have been universal among our Indian races. It had special reference to the descent of the office of sachem, or civil chief. It obtained among the Aztecs, where the sachem was succeeded either by a brother or a nephew, to the exclusion of the son; also among the Iroquois, and the Wyandotts. There are glimpses of it in several other races, but it does not appear to have been made a subject of special examination. Dr. Gulick found the same system in the Micronesian Islands—(Missionary Herald, 1853, p 90); it is said also to prevail in New Grenada in South America, and in Australia. Dr. Livingstone furnishes some evidence of its existence in the tribes of the Banyi, on

the Zambesi River, in Africa, (Livingstone's Travels, pp. 660–669.) Herodotus found the same thing among the Lycians of Asia Minor.—(Herod., Lib. 1, c. 173.)

"Of the universality of the Iroquois system of relationship upon this continent we have more evidence. In addition to the Iroquois, it obtains among the Creeks and Chippewas. The system of the Dakotas, as far as it is given in Riggs' Lexicon, is precisely that of the Iroquois. Without looking beyond these, it is sufficient, for the present, that it prevails in the principal branches of four of the great Indian families: the Hodenosaunian, the Appalachian, the Algonquin, and the Dakotan."

Following out his idea, accordingly, Mr. Morgan has printed a very elaborate and minute series of queries relative to degrees of relationships, and the names by which such are designated. These he has distributed, with a view to obtain, in the first place, a full knowledge of the systems pertaining among all the Indian tribes of the continent. Some of these placed in our hands for the purpose of co-operating in this interesting inquiry, we have recently had the satisfaction of entrusting to the efficient hands of Sir George Simpson, who has kindly undertaken to distribute them among the most experienced officers of the Hudson's Bay Company, and others most fitted to aid in such investigations; especially with a view to ascertain if any traces of a similar social system survive among the Esquimaux. Should such prove to be the case, they must next be sought among their Kamschatkadale congeners on the further side of the Straights, and so westward into the Asiatic, or "Eastern" continent, as Europeans regard it.

D. W.

A CURIOUS COMPUTATION—NUMBERING THE HAIRS OF THE HEAD.

The *Medical Times* says:—A German *savant* has taken the trouble to count the number of hairs existing in four heads of hair of different colours. He found in a blond, 140,409 distinct hairs; in a brown, 109,440; in a black, 102,960; and in a red, 88,740.

MATHEMATICS AND NATURAL PHILOSOPHY.

MAGNETIC ACTION OF THE SUN.

Mr. Brayley gave a lecture last month, at the London Institution, "On the Magnetic Action of the Sun, and its connexion with the Spots, the Earth's Magnetism, and the Polar Lights." The principal object of this lecture was to give an illustrated outline of one great result of the discussion (by Major-General Sabine) of the observations made at the British Colonial Magnetic Observatories; by which as it has been said, we are "landed in a system of cosmical relations, in which both the sun and the earth, and probably the whole planetary system, are implicated." In the opinion of the Joint Magnetic Committee of the British Association for the Advancement of Science and the Royal Society, expressed in their Report just published by the latter body, that discussion has not merely brought into view, but fully established, the existence of a very extraordinary periodicity in the extent of fluctuation of all the magnetic elements, which connects them

directly with the physical constitution of the Sun, and with the periodical greater or less prevalence of spots on its surface,—the maxima of the amount of fluctuation corresponding with the maxima of the spots, and these again with those of the exhibitions of the Aurora Borealis, which thus appears also to be subject to the same law of periodicity. The discovery made by General Sabine of a decennial period in all those magnetic influences at the surface of the globe, which, by their dependence on the hours of solar time, led him to recognize the Sun as their primary cause—operating, however, in some other manner than by its heat—was explained by reference to the observations of Arago on the diurnal variation of the declination, which were purposely selected by the lecturer, as giving independent evidence on the subject, having been made before the establishment of the British Magnetic Observatories, and because that philosopher was evidently unaware of the existence of the periodicity they demonstrate, in common with the later and different observations in which the decennial period was first recognized by Sabine. A general view was then taken of the phenomena of the Solar Spots, and of the analogy between them and the revolving storms of our own atmosphere, first inferred by Sir John Herschel, and since remarkably confirmed, it was stated, by the observations of the Rev. R. Dawes, on the rotation of the spots about their own centres, and those of Mr. Carrington, on the currents in which they appear to drift across the Sun; and the discovery of a decennial period in their amount and frequency by Schwabe of Dessau, in the observations which he has carried on for the third part of a century, was described by reference to tables comparing the periods of the maxima and the minima of the spots with those of the magnetic fluctuations as made known by Sabine, which were thus shown to be, when complete, corresponding periods of ten years. The enormous activity in certain regions of the Sun, indicated by the magnitude of the spots, and the rapidity of their motions and changes, it was suggested, was adequate to any conceivable exertion of force upon the Earth. In proceeding to the third subject of this law of periodicity, the Polar Lights, after a brief description of their characteristic phenomena, Mr. Brayley stated that, in his opinion, the only suggestion of their cause hitherto enunciated, in the nature of a *vera causa*, had been made by Professor Faraday, and had been amply verified by facts subsequently observed,—a statement now made for the first time. In the Bakerian Lecture, read before the Royal Society in 1832, relating his discovery of terrestrial magneto-electric induction, Mr. Faraday showed that effects similar to those he had obtained by instrumental means, but infinitely greater in force, might be produced by the action of the globe, as a magnet, upon its own mass, in consequence of its diurnal rotation; and, in the sequel, he asked whether the Aurora Borealis and Australis might not be the discharge of electricity thus urged towards the poles, and endeavouring to return, above the earth, to the equatorial regions; citing, as in accordance with an affirmative reply, th effect of an aurora upon the magnetic needle recorded by Mr. R. W. Fox. He did not pursue the subject; but the hypothesis has been abundantly verified, with respect to the production of terrestrial currents of electricity, in the manner inferred, by the earth's rotation, and the other natural motions of conductors cutting the magnetic curves, by facts which the electric telegraph, land and submarine, has disclosed, and some of which were recited; while all the

phenomena of the Polar Lights themselves, especially those which are susceptible of precise measurement and instrumental observation, conspire to verify Faraday's suggestion as to their immediate nature and cause. That they are truly electrical in their nature, an inference rendered so probable by their obvious phenomena, Mr. Brayley considered to be proved by their (electro-magnetic inductive) effects on the magnetic elements; nothing hitherto known having the power of producing such effects but magnetism itself, and electricity, while no phenomena of the former are luminous,—there is no magnetic light;—and the absence of atmospheric electricity during the display of the aurora, paradoxical as it may seem, is a necessary consequence, the electricity being absorbed, as it were, by its conversion into the correlate magnetism, or, in other words, ceasing to be statically manifested while being dynamically exerted. Some experimental illustrations of the electrical nature of the Polar Lights were then exhibited, in which the luminous disruptive discharge was taken in exhausted tubes, that is, in excessively rare media, resembling in their attenuation the atmosphere itself, at the elevations where the aurora occurs; one of the tubes, prepared by M. Gassiot, showing the stratified discharge, (originally obtained by Mr. Grove,) recently cited by Humboldt in evidence that the dark spaces in the Aurora may be real, and not merely the effect of contrast. The source of the electricity in these experiments being the apparatus termed the Ruhmkorff coil, the close accordance between them and the natural phenomena was pointed out, in the fact that the electricity was obtained by a process of magneto-electric induction, exactly analogous, on the small scale, to the natural process to which, operating in the globe itself, Faraday has referred the electricity manifested in the Polar Lights. The actual influence of the Aurora on the magnetic elements was exemplified by three photographs from the self-registering apparatus at the Kew Observatory, on which the vertical, the horizontal, and the total-force magnetometers, respectively, had recordered the disturbances produced in them by the Aurora of December 3, 1858. The facts establishing the participation of the Polar Lights in the great law of solar periodicity which it had been the object of the lecturer thus generally to explain, were then briefly stated; and the conclusion was deduced, that the relation of the periodicity to the electrical causation of the Polar Lights, is simply this,—that the magnetic action of the Sun periodically affects the terrestrial magnetism, which, being converted into electricity by the earth's rotation and moving conductors, agreeably to the theory maintained, exhibits the period in the polar discharges of that electricity.

MISCELLANEOUS.

CHINESE RIVERS.

At a recent meeting of the Geographical Society of London, one of the papers read was entitled "Notes of a Voyage up the Yang-tse-Keang, from Wosung to Han-kow, by Lawrence Oliphant, Esq., Secretary to the Earl of Elgin. With a Chart of the River, by Capt. Sherard Osborn, R.N., in command of Her Majesty's Ship Furious." We borrow the following abstract of it from the report furnished to the Athenæum:—The author commented on the importance of the voyage of the Earl of Elgin, in a political, commercial, and geographical sense, and observed

that the ascent for the first time of an unknown river for a distance of upwards of 600 miles is a great achievement. In absence of information as to the breadth of the river and the nature of its channels, and as some of the principal cities were known, and several of the fortified places were suspected, to be in the hands of the rebels, it was deemed prudent to proceed with an efficent squadron; accordingly, Her Majesty's ships Retribution, Furious, and Cruiser, and gunboats Dove and Lee were selected for the purpose; the Retribution, however, owing to her great draught of water, was left at Kew-Shien, about 90 miles above Nanking, and the remainder succeeded in ascending the river—overcoming all obstacles in the shape of rebels and shoals—to Han-kow. Within the last few years the channel of the river up to Nanking is so entirely changed, shoals existing where the charts indicated deep water, as to neutralize the advantages derived from the experience of former surveyors; nor is this transformation confined to the bed of the river—the same occurs with its banks, and former landmarks had either disappeared altogether, or were so completely altered as to be undistinguishable. The direction of the current follows the same law of change, and to such a degree, in the opinion of the author, as to render, in our altered relations with China, an extended survey essential to the interests of commerce. Passing the Imperialist fleet, which was blockading Nanking, then held by the rebels, the latter fired on a flag of truce which was hoisted, the result of which was the silencing and partial demolition of their batteries. Continuing the ascent, and leaving behind several towns, here, held by the Imperialists and there by the rebels, the squadron entered the comparatively narrowed passage by the Eastern and Western Pillar Hills; the former rising to a height of from 300 to 400 feet out of the water, crowned with a crenellated wall with batteries—the latter shaped like Gibraltar, on a smaller scale, and covered with fortifications extending some distance along the shore, effectually commanding the passage, and rendering such a position, in the hands of a European Power, impregnable. Leaving Kew-Shien, the expedition proceeded on their voyage—the hills on the banks rising to a height of 2,000 feet, richly wooded—and reached Ta-Keang, where this range winds rapidly away in a southerly direction, the river following an opposite course, and widening into noble reaches of great depth; and a range of hills to the north then commences. Up to this point the navigation is unattended with any great difficulty, and the soundings are regular. Continuing their course, large lakes were visible from the mast-head on both sides; in summer they are filled by the overflowing waters of the Ta-Keang, and are subject to annual inundations. The author here notices the principal towns and villages, and the chief features and the character of the country on either bank. With the exception of the Tsung-yang river which joins a lake a little above Nanking, all those tributaries marked as such in the maps were mere ditches, almost dry in the winter; but here the Great Lake meets a mighty feeder in the Poyang Lake, discharging into it the whole drainage of the province of Keang-si. Throughout the whole length of the voyage to Han-kow the banks, and the cultivation on them, retain much of the same character. The cotton of the district of Kin-kwoh is celebrated. There can be little doubt that the natural advantages Han-kow possesses must always render it of great importance in a commercial point of view; and it is not easy to estimate the effect which the concentration of a foreign community, and the accumulation of foreign capital may produce upon the river traffic generally.

THE EXHIBITION OF 1861.

The Society of Arts has issued the following resolutions in reference to the establishment of Decennial Exhibitions in Great Britain, the first of which it proposes to hold in London in 1861:

EXHIBITION IN 1861.

At a special meeting of the Council of the Society for the Encouragement of Arts, Manufactures and Commerce, the following resolutions were passed:—

The Council of the Society of Arts, bearing in mind the part which the Society took in originating the Great Exhibition of 1851, have considered it to be their duty carefully to examine various suggestions for holding an Exhibition in 1861, which have been submitted to them and have resolved:—

1. That the institution of Decennial Exhibitions in London for the purpose of showing the progress made in industry and art during each period of ten years, would tend greatly to the "Encouragement of Arts, Manufactures, and Commerce."

2. That the first of these Exhibitions ought not to be a repetition of the Exhibition of 1851, which must be considered an exceptional event, but should be an Exhibition of works selected for excellence, illustrating especially the progress of industry and art, and arranged according to classes, and not countries, and that it should comprehend music and also painting, which was excluded in 1851.

3. That foreigners should be invited to exhibit on the same conditions as British exhibitors.

4. That the Council will proceed to consider how the foregoing resolutions can be best carried into effect.

P. LE NEVE FOSTER, *Secretary.*

Society's House, Adelphi, London.

The London *Globe* thus discusses the proposition put forward by the Society of Arts to hold an Exhibition in 1861, setting forth, in the first place, some of the reasons for holding such an Exhibition; secondly, what should be its nature; and thirdly, the most suitable site for holding it.

How far is the decennial period likely to afford an opportunity for bringing together such a collection of articles and products as will justify the Society of Arts in entering upon so large and responsible an undertaking? What, we may ask, is ten years capable of, and what are its results in a commercial point of view?

Looking back for that period in England, we find that several new arts and industries have arisen, and old ones have been extended. Scarcely more than ten years have passed since the submarine telegraphs were unknown; the screw propeller applied to our steam-vessels; the glass-duty removed; the great improvements and advancement in the trade and products of the Staffordshire potteries effected; the manufacture of bricks left free to take such form as may be required; the excise duty on soap got rid of; photography and chromatic printing introduced and perfected as arts; gutta percha and many vegetable oils from our Colonies, such as the Bassia Latifolia and the Cahoun Palm, introduced as new raw materials in commerce; whilst the declared value of our exported manufactures has risen

from 65,756,000*l*. in 1851, to 122,155,000*l*. in 1857. Add to the above the fact, that within ten years the resources of our Colonies have been largely developed, and the commercial world has acquired three additional emporia: two on the shores of the Pacific, and one on the great American Lakes, viz., San Francisco, Melbourne, and Chicago, none of which are even named in the edition of Mr. M'Culloch's Dictionary of Geography, published in 1849; also that China and Japan have now been opened to trade with England; and we cannot but come to the conclusion that ten years is a period fully sufficient to justify the Society of Arts in proposing to hold an Exhibition in 1861.

It must never be forgotten in the present age, that the great secret of success in commerce is rapidity of action and correspondence. This is greatly aided by a penny post and the electric telegraph, and the merchant or manufacturer who fails to made free use of either or both of these means, inevitably falls into the rear of his competitors. What the telegraph and post are to the merchant and manufacturer, Exhibitions must be to the general public—they are the telegraphs by which the public may be made rapidly acquainted with the new products of our Colonies and the application of those products to our wants.

In 1624 the celebrated Act for the abolition of monopolies was passed, and England's trade has been left free to develop itself in the majority of cases ever since. The extended publication to the world of our capability and power as producers must ever tend to the increase of trade. It is not sufficient to produce, or possess the power of producing, we must make our products known to the greatest possible extent. The recognition of this principle led to the establishment of Exhibitions in France at a time when its factories were full of their finest productions, but no demand existed for them; the demand was created by means of Exhibitions. England did not put forth its full power in 1851; Exhibitions were then a new and unexplored field to our manufacturers. Many were in ignorance of their nature, or prejudiced against them, and therefore withheld their contributions; where prejudice then existed it has since been removed. New firms, and those manufacturers who had scarcely begun life ten years ago, will, by means of an Exhibition in 1861, be enabled to put forth their energy and display their skill as manufacturers, and thus attain to that position which competition in private tends much to retard. The eleven Exhibitions of France prove that, however adverse the times, or unsettled commerce may be, the number of producers has ever been on the increase, and they are ever ready to contribute their productions at such displays. The seaboard of England and its insular position do not afford our merchants and manufacturers the same advantages over the other producing countries of Europe which England had previous to the construction of railways and telegraphs; the latter enabling prices to be learned and purchases effected at great distances, whilst by the former the goods are conveyed from the seat of production in the interior of a country to the coast without delay, and at a little cost. England having attained to pre-eminence as a manufacturing country, such pre-eminence can only be maintained by a full and constant development, and such development will take place only in proportion to the demand for improved machinery or manufactures. It is a fallacy to suppose that Exhibitions will deprive our manufacturers of the advantages they possess, by laying open their

improved means of production to others. Since 1851 almost every producing country in Europe, many of our colonies, and America, have recognized the importance and necessity for holding such industrial gatherings. The nature of the articles produced for home consumption and foreign markets can best be made known by such Exhibitions, and they serve as finger-posts in the history of industrial progress. The producing powers of our colonies demand of England that their capabilities to supply the markets of the world with every description of produce should be made known periodically in the metropolis of the empire. The products of the animal, vegetable, and mineral kingdoms are better understood and more closely studied now than formerly, and are daily adding new substances and increased comforts for our use, and such Exhibitions tend to direct the mind of working communities to peaceable occupations and competitions, and thereby induce more friendly interchanges with foreign nations.

WHAT IT SHOULD BE.

The Exhibition of 1851 has been described as a piece of barbaric pomp—of gorgeous colours and heaped-up wealth, and not a museum of Western progress. How far such a description is correct the public can judge; it must, however, be the object of the Society of Arts, in carrying out the Exhibition of 1861, to place it before the world in such a form as shall leave no doubt as to its being an Exhibition illustrative of progress. In order to the attainment of that end, it must in every respect be a People's Exhibition, paid for by the people's shillings. The results of the Exhibition of 1851 are conclusive evidence that no necessity exists for special subscriptions or government subsidy. It should be an educational exhibition, enabling us by comparison, in classes, to see wherein we are deficient as a manufacturing nation, and in what direction to look for improved appliances or raw materials, thereby enabling us the better to compete with foreign producers. It must teach us what the people of other lands appreciate, and would purchase from us, if produced by our manufacturers, thereby extending the trade of the country and opening up commerce in directions at present little supplied; as in the case of the Indian market, where, to quote the words of Colonel Sykes, Chairman of the East India Company, "Very little of the personal clothing of 150,000,000 of people in India is exported to India, and none of it in the form of fabrics in which the articles of clothing are worn, an omission which the manufacturers of England might surely supply." It should be a Universal or Free Trade Exhibition, so far as is consistent with the laws of the country. It should be a Comparative Exhibition—the cottons of Manchester and Glasgow side by side with those of France and America—the linens of Ireland by those of Belgium—the wools of England, Australia, and Thibet in close proximity.

It should be a Classified Exhibition: how entirely distinct must it be then from the Exhibition of 1851. Who that had occasion to collect the information contained in that Exhibition, as every member of the press who wrote for the guidance and instruction of the public had, but felt the want of classification? To have been able to have compared the porcelain of Sèvres, Belgium, Austria, Dresden, Berlin, and Prussia, with that of Staffordshire, Worcestershire, and other parts of the United Kingdom, what an incomparable advantage would it have been! How

important to our Yorkshire woollen trade, had our manufacturers been able, side by side, to have contrasted the productions of France, Belgium, Vienna, Saxony, Aix-la-Chapelle, and Prussia, with the cloth and mixed goods produced at Leeds, Bradford, Stroud, and Dublin. What labour and fatigue would have been saved, had we been able to view the metal-work and jewellery of France, Belgium, Holland, and Spain, with that of England in a court by itself. How will those attending the next exhibition divide themselves into groups under such an arrangement? There will be the Swiss side by side with the man of Coventry and Clerkenwell, discussing each the merits of his competitor for the trade in watches; the silk manufacturers of Lyons, Spitalfields, and Manchester, comparing their silks; and chemists and dyers, the effects resulting from the discovery of new sources of supply of colour, and new methods of applying those already known. How interesting will it be to juxtapose the wood-carvings of Switzerland and Italy with the productions of Rogers in England, or the results of the application of machinery in that direction; the inlaid wood of Austria with that of other countries. A court of the cabinet marqueterie and buhl work of the world, how instructive may it be made; and the same principle, if applied to the paper-hangings of France, London, and Manchester, the agricultural machines of America and England, the steel of Germany, Sweden, America and Sheffield, will tend to render the Exhibition of 1861, not merely a monster bazaar, but a book, well digested and arranged for ready reference, affording at once the information so frequently sought for, and oftimes in vain, in its predecessor.

The Exhibition of 1861 should also comprise well-arranged series of raw products, with the prices at which they can be obtained in our markets: the mineral products of our colonies and foreign countries—the cottons of Africa, India, America, and Australia—the oils of the Polar regions—the tallow of Russia—the vegetable oils of India, and of the forests of British Honduras, America, and Australia—the mineral oils of Trinidad, and those obtained from the coal fields of England. Nor must our machinery be excluded from the great gathering of 1861. It is of vast importance to the engineers of this country, that they should know what is being produced in the great workshops of Belgium, France, and America. But it is not desirable that the vast blocks of coal and masses of stone should again be produced for exhibition as they were presented to the public in 1851; nor is it necessary that the world should be searched to produce in our next exhibition building a competitor for the great Koh-i-noor, or masses of gold quartz from California.

It must be a Progressive Exhibition, and should include specimens of articles for which prizes were awarded in 1851, in order that the improvements effected and advances made since that date may be more readily seen. It must be an Industrial and Art-fostering Exhibition, because an increased knowledge of art involves an increased love for art, and gives a higher moral tone to the community employed in its production, and a higher appreciation of it by those who purchase its productions. The greater extent to which art and skilled labour is employed in connection with our manufactures, the larger will be the amount of capital created by labor in the country for future use. It is well known that the value of the metal used in the construction of the hair-spring of a watch can scarcely be estimated,

but by the employment of skilled labor, a ton of iron converted into steel, and then manufactured into watch springs, becomes of enormously increased value; so it will be wherever art is introduced, and a greatly increased value will be given to the material employed. It should comprise a selection of specimens of ancient art, of all ages and from every country, which may serve as types to be studied by our artizans and workers in metal, ivory, wood, stone, or other material. It must be a Fine-Art Exhibition, because in England fine art is an extensive industry peculiar in its characteristics, and was excluded from our former Exhibition. The Exhibition of Industry and Art in Paris, and more recently of Art at Manchester, has proved that the public of this country will appreciate and support such collections if brought together for their instruction, and it is needless to attempt to show that if a high class of music is introduced as a feature, it will be listened to and sought after at a time when it forms, more than ever it did in this country, part of the education of almost every child. The Exhibition throughout must aim at teaching some lesson in each of its departments, so that we may look back upon it hereafter as the point and period in industrial progress from which we may date the increased commercial prosperity and improved social condition of the people of England. That such will be the result of the Exhibition of 1861, if carried out in its integrity, and upon the basis put forward by the Society of Arts, we cannot doubt; and looking forward to its realization, we commend it to the hearty support of our readers and the public both at home and abroad.

WHERE IT SHOULD BE.

The Society of Arts, in proposing to hold another Great Exhibition of the Industry of all Nations in 1861, has not yet put forth any statement in reference to the site upon which it proposes to place such a collection. Does it by its silence on this point imply that the Crystal Palace, or the buildings recently erected at Brompton, in an extended form, are to receive the collection? The former, we presume, is not probable, as it cannot be thought that the Crystal Palace Company would give them the use of its building, unless at a heavy rental, to which would have to be added the cost of all but emptying it of much of its present contents, which when effected would not render it capable of affording facilities for the same brilliant display and bold effective arrangement of goods as did the building in Hyde Park. Neither do the Crystal Palace and other Railways connected with it, afford the necessary facilities for conveying to an Exhibition, held at Sydenham, such large numbers of visitors as frequented the Exhibition in Hyde Park in 1851. Inconvenience is at present experienced, when not more than thirty-five or forty thousand persons visit the Crystal Palace on gala days; and it is known that more than one hundred thousand entered the Hyde Park Exhibition and left it, without inconvenience, in a single day; and it is necessary to provide for a maximum number. With reference to the buildings at Brompton, they are already filled with specimens of all kinds, and are constantly used in connection with the schools of the Educational Department of the Government and the Department of Science and Art, and cannot, we imagine, be cleared out for the purpose of temporary exhibition; nor are the buildings there erected of sufficient extent or of a character suited for a great international display and world's fair of industry, science, and the polite arts. Where, then, is the Exhibition to be held? Is a new building to be put up?

and upon what site? Much has already been written in some of the daily and weekly press, upon the assumption that a new building is to be erected If such is the fact, the Society of Arts would do well to take immediate steps to secure suitable designs for the building they will require. The experience gained by the Royal Commission, and for which it paid so dearly in 1851, must surely be remembered by them. The work then done in haste was highly creditable to the skill, ingenuity, and perseverance of the contractors: but at what cost was it effected? Why, £85,000 above the contract price is stated to have been allowed to Messrs. Fox, Henderson & Co., the original contract being to erect the building designed by Mr. Paxton for £79,800. Surely, such a result will be sufficient inducement to the Society of Arts to at once set about obtaining designs and contracts for the required building. Where, then, is the Exhibition building to be placed? Government will certainly not allow a second Crystal Palace to be erected in Hyde Park. Is Battersea Park to be the site? We would hope not; as although a fine building placed on the banks of the Thames would form an interesting object to those who pass up and down that river in the steamboats, we much doubt if the land is suited to receive so large a building as will necessarily be required. To form an imposing object, it must be on the river bank; if placed on the flat portion of the park, all picturesque and architectural effect would be lost, at the same time that the foundation would be unsound and exceedingly wet. Moreover, is Battersea Park a desirable site for an Exhibition in point of accessibility? We think not. The great majority of the English and London population reside north of the Thames, and our railways communicating with the seats of industry in the Midland and Northern Counties of England have no connection with the south side of that river, nor are there many direct approaches for the ready carriage of goods through the metropolis to it. Is the new Palace proposed to be built at Muswell Hill a speculation, in anticipation of the possibility of its being opened in 1861 as the successor of the Exhibition in Hyde Park? If so, we fear it also is far too inaccessible. Are Victoria, or Regent's Park, Primrose Hill, the proposed site for the Finsbury Park, available? Regent's Park or Finsbury Park are far more accessible than the others, but is the Government to be called on to aid the Society of Arts to obtain a site, or will the Commissioners of the Exhibition of 1851 lend their land at Kensington for the time being for such a purpose? If the latter can be obtained we believe it possesses many points in its favour. There is an identity of locality in the minds of foreigners and the British public at once effected; it is accessible from many leading thoroughfares—it is not far distant from our railways, and if any of the plans for uniting the London and North-Western, the Great Western, and North London Railways with those on the south side of the river, which are are already deposited and advertised to be brought before Parliament next session, can be carried out,—and some such plan must be carried out,—the goods from our great seats of industry might then be delivered at once, by means of a short branch line, on to the grounds of the Exhibition itself without delay, and at a diminished cost. We would urge on the attention of the Society of Arts the above considerations. The year 1861 is not far distant, and if time is lost in settling the design of the building, or the site on which it is to be built, it can only be at a greatly increased cost on its ultimate completion.

CANADIAN INSTITUTE.

SESSION—1858-59.

THIRD ORDINARY MEETING—*8th January*, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentlemen were elected Members*:

CHARLES H. W. A'COURT, Esq., London, England.
CAPT. JOHN FERRIS, Staff Officer of Pensioners, Toronto.
JOHN KERR, Esq., Toronto.
Professor G. LAWSON, Kingston, C. W.
S. S. MACDONALD, Esq., Windsor, C. W.

II. *The following donations to the Library and Museum were announced, and the thanks of the Institute voted to the donors*:

FOR THE MUSEUM.

1. MAJOR LACHLAN, CINCINATTI, OHIO.

Collection of Silurian Fossils from Mount Auburn, Ohio .... Parcels 25

2. REV. V. CLEMENTI, B.A., PETERBOROUGH.

The Skull of a Beaver, (*Castor Fiber*.).................................. 1

FOR LIBRARY.

1. MAJOR LACHLAN.

Christy's Letters on Geology.
Second Preliminary report of the Nantahala and Tuckasege Land and Mineral Company, 1858.

2. CHICAGO HISTORICAL SOCIETY.

Charter Constitution and By-laws.

3. PROFESSOR G. LAWSON, KINGSTON, C. W.

Transactions of the Scottish Arboricultural Society. Vol. 1. Parts 1, 2, and 3.
Remarks on Lopas Anatifera. Linn.
On the occurrence of Conchonaceous in Galeacea.
On the structure of the Victoria Regia.
Report on Musci and Desmidea, &c.
Papers Read to the Botanical Society of Edinburgh.
Bermuteungen.

III. *The following Papers were read*:

1. By the President, the Hon. G. W. Allan:
The Annual Address.

2. By Dr. Harvey, of Hamilton:
"On the increase and decline of Malarious diseases in the Valley of the Grand River."

IV. A discussion took place on the proposal to change the night of Meeting from Saturday to some other night.

On the motion of F. W. Cumberland, Esq., seconded by the Rev. Professor Kendall, Friday was named as the regular night of Meeting.

It was moved in amendment, by P. Freeland, Esq., seconded by the Hon. W. Robinson, "that it is at present inexpedient to change the night of Meeting;" the amendment being put was carried by a large majority.

V. It was then moved by F. W. Cumberland, Esq., seconded by W. Duggan, Esq., "that it be remitted to the Council to consider and report on some measure for giving expressions to the appreciation with which this Institute continues to regard the liberal provisions made for the Geological Survey of Canada and to the satisfaction with which the Institute welcomes the Publications of Sir W. Logan's staff." Carried.

FOURTH ORDINARY MEETING—SESSION 1858-59.

15th January, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentlemen were elected Members:*

JOHN FRANKS, Esq., Toronto.
GEORGE M. HAWKE, Esq., Toronto.
W. WEIR, Esq., Toronto.

II. *The following donations to the Library were announced, and the thanks of the Institute voted to the donors:*

HON. J. M. BROADHEAD, WASHINGTON.

1. Patent Office Report for 1857—Agriculture, Vol. 1; Mechanics, Vols. 1. 2, 3.

THE SMITHSONIAN ISTITUTION.

2. Smithsonian Report for 1857; Explorations &c., for Railroad Route from Mississippi to Pacific, Vol. 8.

OFFICE OF ROUTINE AND RECORDS.

Appendix 2 to 4, vol. 16 of Journals of House of Assembly, 1858.
Do. 13 to 20 vol. 16 do. do. do.

FROM PROFESSOR KINGSTON, M.A.

Report of Joint Committee of Royal Society and British Association, for continuing Magnetical and Meteorological Observations in certain Colonies of Great Britain.

III. *The following Papers were read:*

1. By Professor Chapman:

"Sketch of the Geology of Ohio," accompanying a series of Specimens illustrative of the same, by Major Lachlan.

2. By Professor D. Wilson, LL.D.:

"Notice of an ancient stone axe, inscribed in unknown characters, recently turned up by the plough in New Jersey."

SIXTH ORDINARY MEETING—SESSION 1858-59.

22nd January, 1859.

JOHN LANGTON, Esq., Vice-President, in the Chair.

I. *The following Gentleman was elected Member* :

JAMES HALL, Esq., Toronto.

II. *The following donations for the Library and Museum were announced, and the thanks of the Institute voted to the donors:*

FOR THE LIBRARY.

REV. PROFESSOR KENDALL, B.A.

1. Theory and Experiment, a lecture delivered before the Board of Arts and Manfacrures of Lower Canada.

THE AUTHORS.

1. Defence of Dr. Gould by the Scientific Council of the Dudley Observatory 2nd edition.

FOR THE MUSEUM.

HIS EXCELLENCY THE GOVERNOR GENERAL.

1. Specimens of the Coinage of Canada, in a case containing two 20 cent pieces two 10 cent pieces, and two 5 cent pieces,—silver.
   Two 1 cent pieces,—copper.

III. *The following Papers were read:*

1. By Andrew Russell, Esq. :
   "Report upon Explorations in the North-West."
2. By Professor Croft, D.C.L. :
   "On Dust Storms."

SIXTH ORDINARY MEETING—SESSION 1858-59.

29th January, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following donations for the Library and Museum were announced, and the thanks of the Institute voted to the donors:*

FOR THE LIBRARY.

THE REGENTS OF THE UNIVERSITY OF NEW YORK ON BEHALF OF THE STATE OF NEW YORK.

Documents relative to the Colonial History of New York. Vol. 2.

Catalogue of the Books on Bibliography, Typography and Engraving, in the State Library, 1858.

Annual Report of the Trustees, Feb., 1858.

71st Annual Report of the Regents, &c., Jan., 1858.

11th Annual Report of the State Cabinet of Natural History, March, 1858.

H. G. BOHN ESQ., LONDON, PER A. H. ARMOUR, ESQ.

Diary and Correspondence of S. Pepys. Vols. 1, 2, 3, and 4.	Bohn's Hist. Libr.		4
The Pretenders and their Adherents	"	"	1
Life of John Locke, by Lord King	Standard Library		1
Neander's Christian Dogmas	"	"	1

Neander's General History of the Christian Religion		2
The Bibliographers' Manual of English Literature		2
Orlando Furioso. Translated by L. Ariosto	Illustrated Library	2
Holbein's Dance of Death	"	1
Parables of F. A. Krummacher	"	1
A Book for a Corner	"	1
Noble Deeds of Woman	"	1
Pope's Poetical Works. Vol. 2	"	1
Anecdotes of Dogs, by Jesse	"	1
Elements of Botany, by M. A. de Jessieu. Translated by J. H. Wilson	Scientific Library.	1
Humboldt's Cosmos. Vol.5	"	1
Mantel's Medals of Creation. Vols. 1 and 2	"	2
Vegetable Physiology, by Carpenter	"	1
	Total	25

FOR THE MUSEUM.

1. W. Hay, Esq., Architect.

Specimens of Brainstone (Meandrina Cerebreformis) from the Bermudas.

2. A. H. Armour, Esq.

Specimen of Tripe de Roche.

II. *The following Papers were read:*

1. By Dr. Rae;
   "On the Formation of Icebergs and the Transportation of Boulders."
2. By Dr. Morris:
   "On a species of intestinal worm found in the white fish."

(*To be continued.*)

MEAN RESULTS OF METEOROLOGICAL OBSERVATIONS AT HAMILTON, CANADA WEST, FOR THE YEAR 1858.

BY DR. CRAIGIE.

1858.	THERMOMETER.					BAROMETER.			DAYS.			YEARS.
MONTHS.	Mean at 9 A.M.	Mean at 9 P.M	Mean of both.	Highest	Lowest.	Mean.	Highest.	Lowest.	Rainy.	Slight showers.	Dry.	Mean Temperature of
January ...	31 90°	33 54°	32 22°	56°	12°	29.671	30 32	29.10	0	11	20	1846 .. 50 215
February .	19.32	20 14	19 98	47	−10	608	29 98	28.94	4	7	17	1847 48.163
March	31 935	32.419	32 177	65	2	.692	30.10	. 90	2	8	20	1848 . 49.295
April	44. 43	44.73	44 58	78	21	53	29 98	29 10	4	5	21	1849 .48.105
May	51 74	50 63	51.18	80	35	614	30 14	10	6	5	20	1850 . 48.732
June	71 95	69 76	70 65	96	46	.612	29.93	...96	3	8	19	1851 48.756
July	72.42	70 60	71.61	92	54	...698	93	45	3	6	22	1852 48 248
August ...	72.00	70.84	71.42	93	47	.698	90	.. 32	2	5	24	1853 49.474
September	63 63	62 86	63.20	89	35	719	30 04	...30	1	6	23	1854 .49.013
October . .	53 03	52 61	52 82	80	32	71	03	. 05	2	7	22	1855 ..47.316
November	36 3	37 2	36.75	60	18	...606	29.93	...20	5	8	17	1856...44 888
December .	30.613	31.225	30.910	56	8	.682	30 24	...09	6	10	16	1857...46.668
Mean Temperature of Year...			48.142	....		29 845	......	....	38 96			

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—FEBRUARY, 18[illegible].

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Excess of mean above Average.	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't.	M'N.	Rain in inches.	Snow in inches.
1	29.846	29.785	29.746	29.7807	28.8	33.9	31.4	31.22	+ 7.33	.129	.128	.113	.123	.81	.65	.64	.70	W S W	Calm	N E	N 72 E	0.6	0.0	5.8	4.41	5.14		
2	.709	.596	.479	.5838	23.3	19.6	19.1	19.22	– 4.62	.107	[illegible]	.092	.091	.89	.68	.82	.77	E N E	N E b E	N N E	N 40 E	12.5	11.5	15.4	10.78	11.11		0.4
3	.840	.267	.270	.2872	13.6	17.3	14.2	15.20	– 6.57	.072	.079	.090	.077	.90	.83	.88	.80	N N E	N	Calm	N 10 E	9.8	6.2	0.0	3.33	3.79		2.0
4	.377	.847	.677	.4192	15.5	22.7	19.0	19.43	– 4.23	.076	.071	.075	.079	.85	.58	.76	.76	Calm	S W	W S W	S 66 W	0.0	10.6	4.2	8.83	8.94	.	0.2
5	.774	.864	.838	.8260	17.7	22.9	20.9	20.33	– 3.25	.087	.081	.105	.089	.90	.66	.94	.82	W S W	W S W	N E b E	N 49 W	11.2	1.8	5.6	1.15	6.42		2.6
6	.780	.854		—	19.8	24.8				.095	.105			.90	.79	—	—	N N W	N b W	N W b N	N 20 W	6.4	9.5	8.5	9.15	9.26	.	0.1
7	.906	.830	.764	.8097	13.3	23.4	25.0	20.95	– 2.56	.075	.101	.103	.092	.92	.61	.74	.81	N b W	N	S E b E	S 55 E	7.0	2.8	10.4	3.79	6.34		0.2
8	.650	.547	.483	.5572	24.5	34.6	34.6	30.95	+ 5.78	.109	.148	.159	.137	.82	.74	.79	.78	S b E	S S E	Calm	S 1 E	5.2	8.5	0.0	3.66	3.75	.	0.6
9	.835	.879	.493	.4319	33.2	29.2	19.5	26.42	+ 3.15	.181	.11[illegible]	.084	.111	.96	.65	.47	.71	S S W	N N W	N W b N	N 30 W	3.5	16.5	16.5	12.67	13.40		0.6
10	.697	.789	.987	.8262	9.3	13.2	3.9	9.27	– 14.00	.056	.071	.045	.057	.84	.90	.96	.84	N N W	N N W	Calm.	N 34 W	15.4	8.0	0.0	3.56	6.42	..	
11	.960	.959	.936	.9252	14.4	20.9	15.6	17.07	– 6.20	.064	.063	.078	.070	.76	.55	.86	.75	W b S	Calm	N N W	N 10 W	3.0	0.0	2.6	2.07	2.53		0.2
12	.647	.874	.911	.8815	15.1	19.8	11.6	15.07	– 8.15	.060	.063	.060	.066	.93	.59	.92	.82	N b E	N	N W b N	N 11 W	4.5	6.2	4.4	3.94	4.03		..
13	.907	.830	—	—	6.7	23.0	—		–	.032	.050		—	.93	.65	—	—	N W b N	S W b S	S W	S 61 W	0.4	5.6	12.5	7.64	8.01		-
14	.757	.709	.542	.6579	21.2	25.2	30.1	26.10	+ 2.83	.103	.115	.137	.120	.92	.85	.91	.84	S W	S W b S	Calm	S 33 W	13.0	10.6	0.0	5.90	6.05		...
15	.486	.244	.362	.3463	35.7	36.4	35.7	35.87	+ 12.62	.183	.185	.210	.196	.88	.85	100	.93	S S W	S S W	S W b S	S 58 W	4.5	3.8	1.5	1.84	2.47	.085	...
16	.537	.685	.824	.6950	29.7	37.9	27.4	31.06	+ 7.72	.134	.105	.124	.126	.81	.46	.83	.73	W N W	N W b N	Calm	N 45 W	1.8	2.1	0.0	1.30	2.36		...
17	.951	.690	.581	.6810	24.5	37.1	36.1	33.05	+ 9.70	.123	.142	.200	.157	.95	.65	.94	.85	S S W	E b S	S E b S	S 91 E	1.2	12.0	4.6	4.16	5.13	.075	
18	.409	.620	.729	.6245	35.7	42.6	35.3	37.13	+ 13.70	.201	.188	.170	.187	.96	.69	.83	.85	Calm	S S W	S S W	S 39 W	0.0	5.6	0.5	2.69	2.87		...
19	.646	.865	.187	.5792	27.4	37.9	39.3	35.25	+ 11.72	.131	.160	.232	.179	.88	.69	.96	.86	S S W	E b S	E b S	S 65 E	4.0	6.0	2.4	3.96	4.40	.290	..
20	28.877	28.989	—	—	40.4	38.2	—	—		.245	.147		—	.97	.64	—	—	E	S W b W	W b S	S 86 W	5.0	27.5	29.5	26.86	28.05	inap	inap.
21	29.496	29.623	.752	.6325	25.6	29.2	23.8	25.57	+ 1.83	.089	.098	.110	.093	.63	.54	.66	.67	W b N	W N W	W	N 68 W	32.0	33.7	3.4	17.09	17.83		inap.
22	.725	.594	.560	.6202	23.4	36.2	34.8	31.53	+ 7.72	.093	.130	.169	.140	.75	.75	.84	.77	W	E b S	Calm.	S 15 W	1.0	5.0	0.0	1.36	1.76	inap	...
23	.661	.624	.528	.5332	32.1	42.2	38.2	37.56	+ 13.62	.157	.177	.177	.171	.86	.65	.76	.76	W	S S W	N W b W	N 41 W	1.2	1.4	7.5	5.55	6.64	.055	...
24	.617	.856	.917	.8170	30.3	27.0	22.0	25.65	+ 1.70	.156	.063	.104	.103	.92	.66	.87	.73	N W b N	N W b N	N	N 2 E	26.0	17.0	7.6	12.62	14.70	...	...
25	.673	.786	.681	.7462	15.4	21.6	24.1	20.45	– 3.90	.039	.038	.096	.073	.60	.50	.72	.64	N E b E	E b N	E	N 81 E	15.6	22.0	26.4	20.09	21.26		1.0
26	.303	.295	.613	.3682	23.8	35.5	27.7	30.46	+ 5.95	.144	.190	.113	.147	.90	.90	.74	.85	E b S	S W b W	W S W	S 46 W	20.2	21.5	5.5	7.16	10.62	..	0.5
27	.478	.344	—	—	20.6	39.5	—	—	—	.088	.105	—	—	.85	.67	—	—	Calm.	S W b S	N W	N 85 W	0.0	12.6	12.0	6.62	9.73	..	...
28	.587	.671	.789	.6762	30.3	32.1	27.4	29.65	+ 4.96	.145	.127	.124	.131	.86	.70	.80	.79	W b N	W N W	W N W	N 68 W	13.6	15.4	3.8	13.79	14.11	...	0.2
M	29.6878	29.6828	29.6334	29.6331	23.67	30.12	26.[illegible]	26.94	+ 3.87	.115	.116	.121	.117	.85	.69	.81	.79					7.77	10.06	6.86	....	[illegible]	0.455	6.8

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR FEBRUARY, 1859.

Highest Barometer . . . . 30.002 at 8 a. m. on 11th, } Monthly range=
Lowest Barometer . . . . 28.877 at 6 a. m. on 20th, } 1.125 inches.

Self-register-ing Ther.
Maximum temperature . . . . 46°2 on a.m. of 20th } Monthly range=
Minimum temperature . . . . 2°1 on a. m. of 13th } 44°1
Mean maximum temperature . . 31°85 } Mean daily range = 13°15.
Mean minimum temperature . . 19°71 }
Greatest daily range . . . . . . 21°9 from a. m. to p. m. of 13th.
Least daily range . . . . 3.5 from a. m. to p. m. of 2nd.

Warmest day . . . 23rd .. **Mean Temperature** . . . 37°55 } Difference=28°28.
Coldest day . . . . 13th .. **Mean Temperature** . . . 9°27 }

Maximum { Solar . . . . 64°8 on p. m. of 18th } Monthly range=
Radiation { Terrestrial . . . . −7.8 on a. m. of 13th } 72°6.

Aurora observed on 3 nights, viz.: 1st, 24th, and 28th, possible to see Aurora on 11 nights; impossible on 17 nights.

Snowing on 14 days; depth, 8.3 inches; duration of fall 67.2 hours.

Raining on 6 days, depth, 0.455 inches; duration of fall, 16.7 hours.

Mean of cloudiness=0.74, most cloudy hour observed, 4 p. m., mean=0.83: least cloudy hour observed, midnight, mean=0.61.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
3107.38	1033.96	1300.03	2733.72

Resultant direction, N 54° W ; Resultant Velocity, 2.72 miles per hour.
Mean velocity of the wind 8.50 miles per hour.
Maximum velocity . . . . 37.0 miles per hour, from 5 to 6 p.m. on 20th.
Most windy day . . . . 20th—Mean velocity, 23.05 miles per hour.
Least windy day . . . . . . 15th—Mean velocity, 2.43 do
Most windy hour, noon to 1 p. m.—Mean velocity, 10.23 do } Difference
Least windy hour, 9 to 10 p. m.—Mean velocity, 6.82 do } 3.41 miles.

8th. Solar halo at noon, (imperfect.)
9th. Lunar halo at 6 30 p. m.
11th. Lunar halo and corona from 6.30 p. m. (Very distinct.)
13th. Lunar halo, 6 30 to 8 p. m. (Very perfect.)
17th. Fog from 9.30 p. m.
18th. Fog from 6 a. m. Very mild day.
19th. Dense fog from 7 a. m. Very mild day.
20th. Severe thunderstorm from 1.30 to 3.30 a. m. (First of the season.) Fog from 4 to 9 a. m. Great storm of wind; mean velocity, from 9 a. m. of 20th to 9 a. m. of 21st,—31.13 miles per hour.
23rd. Solar halo from 9.30 a. m. to 3 p. m.

25th. Very stormy day; wind high, and very keen.
28th. Brilliant meteor at 8 15 p.m.; descending from zenith towards NNW, emitting a bright tail, and bursting into small fragments when within about 20° of horizon.

The Resultant Direction and Velocity of the Wind for the month of February, from 1848 to 1859 inclusive, were respectively N 69° W, and 2.93 miles.

The month of February, 1859, was mild and dry; the mean temperature having been 5°21 above the average of 20 years. The depth of rain and snow were both less than the average; the former by 0.588 in. and the latter by 9.0 in. Total deficiency of moisture=1.488 in.

COMPARATIVE TABLE FOR FEBRUARY

YEAR.	TEMPERATURE. Mean.	Difference from Average	Maximum observed.	Minimum observed.	Range.	RAIN. No. of days.	Inches.	SNOW. No. of days.	Inches.	WIND. Resultant Direction.	Resultant Velocity.	Mean Velocity
	°	°	°	°	°					°		
1840	28.0	+ 5.2	49.1	− 8.3	57.4	8	1.475	6	...	...	...	..
1841	22.4	− 0.4	43.4	− 0.3	43.7	1	0.000	9	..	...	...	0.61 lbs
1842	26.9	+ 4.1	48.7	+ 2.5	46.2	8	3.620	9	.	...	...	1.03 "
1843	14.5	− 8.3	37.5	−10.2	47.7	1	0.475	21	14.4	...	...	1.05 "
1844	26.0	+ 3.2	47.1	− 0.4	47.5	4	0.490	7	10.0	...	..	0.48 "
1845	26.0	+ 3.2	46.6	− 3.9	50.5	5	Imp't	9	19.0	...	...	0.99 "
1846	20.4	− 2.4	41.4	−16.2	57.6	0	0.000	13	46.1	...	...	0.66 "
1847	21.5	− 1.3	42.2	− 1.0	43.2	2	0.550	13	27.3	...	..	0.69 "
1848	26.6	+ 3.8	46.9	− 0.6	47.5	4	0.775	8	10.8	N 65 W	2.63	5.69 ms.
1849	19.5	− 3.3	41.1	− 9.2	50.3	2	0.240	13	19.2	N 41 W	1.48	6.58 "
1850	26.0	+ 3.2	49.2	+ 1.3	47.9	7	1.235	9	23.1	N 80 W	3.43	7.61 "
1851	27.6	+ 4.8	50.2	+ 1.3	48.9	7	2.600	4	2.4	N 64 W	1.99	6.94 "
1852	23.4	+ 0.6	41.2	− 3.2	44.4	3	0.650	11	13.0	S 75 W	3.34	6.48 "
1853	24.1	+ 1.3	43.4	− 0.6	44.0	4	1.030	15	12.6	N 49 W	2.51	7.30 "
1854	21.1	− 1.7	42.7	− 5.7	48.4	5	1.480	15	18.0	N 7 E	1.73	6.91 "
1855	15.4	− 7.4	37.3	−25.0	62.3	2	1.770	14	21.8	N 40 W	4.34	8.17 "
1856	15.7	− 7.1	35.3	−18.7	54.0	0	0.000	8	9.7	N 81 W	7.70	10.71 "
1857	28.5	+ 5.7	51.2	− 5.9	57.1	11	3.030	11	11.7	S 78 W	3.68	9.88 "
1858	17.0	− 5.8	40.9	− 6.6	47.5	1	Inapp	18	28.7	N 72 W	3.22	9.12 "
1859	28.0	+ 5.2	43.3	+ 3.9	39.4	6	0.455	14	8.3	N 54 W	3.72	8.50 "
Mean	22.83	...	43.93	−5.34	49.27	4.1	1.043	11.9	17.80	...	...	7.81

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—MARCH, 1859.

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet

Days.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result.	M'N	Rain in Inches.	Snow in Inches.
					°	°	°	°	°												°							
1	30.074	30.030	30.171	30.0916	18.3	23.1	14.4	18.38	− 8.90	008	054	067	060	68	42	79	62	N b E	NWbW	N b W	N 11 W	12.5	10.0	4.5	7.50	7.87	...	...
2	30.417	30.174	29.979	30.1205	10.4	24.5	20.3	21.33	− 4.06	049	084	106	079	70	62	74	67	N b E	E b S	E	N 61 E	3.2	10.8	10.0	7.96	8.52	...	...
3	29.715	29.278	.065	29.3228	29.9	32.2	35.7	33.12	+ 7.40	132	179	192	173	70	96	92	90	E b N	E b N	E b S	S 83 E	13.4	19.8	4.5	7.67	8.90	0.465	...
4	29.976	29.963	29.945	29.9595	38.4	38.6	33.9	35.87	+ 9.47	188	189	182	186	87	90	93	88	S S W	S S W	S W	S 36 W	13.4	13.5	3.2	7.20	7.52	0.040	...
5	29.183	29.376	29.610	29.4657	33.9	41.1	34.8	36.30	+10.30	174	179	144	163	89	68	72	76	W b S	W	W b N	N 74 W	1.0	17.5	7.8	8.11	8.21		...
6	.788	.830		—	34.6	38.2	—		—	172	168	—	—	85	73			W	Calm	Calm.	N 73 E	0.5	0.0	0.0	2.09	2.10		.
7	.003	.512	351	4748	33.9	36.9	37.5	36.83	+ 9.32	154	173	195	177	79	78	86	82	E b N	E b N	E b N	N 74 E	13.8	16.5	19.5	16.03	16.06	0.230	.
8	.140	.333	513	3167	36.9	37.8	33.5	36.17	+ 8.93	208	190	162	184	95	84	84	88	NE b E	N b E	N b W	N 8 E	6.2	4.8	1.5	3.80	3.89	0.012	...
9	.620	.676	722	6826	32.1	39.3	33.5	35.50	+ 7.99	145	171	140	156	90	71	73	76	N b W	Calm.	Calm	S 77 E	0.7	0.0	0.0	0.67	0.82		.
10	.731	.601	642	6856	32.6	38.[illegible]	38.9	36.77	+ 8.[illegible]5	138	162	134	152	85	60	67	70	N E b E	E b N	E N E	N 69 E	4.0	13.4	11.4	9.95	10.03		...
11	.577	.432	214	3942	36.1	45.[illegible]	40.3	42.47	+14.23	152	173	208	205	72	60	84	74	E N E	E N E	E b N	N 83 E	11.3	17.0	8.5	7.69	10.82	0.600	
12	.367	.460	393	4653	39.7	42.3	39.7	40.47	+11.92	217	174	218	198	89	63	89	79	S S W	W b S	W S W	S 47 W	11.0	17.4	4.2	9.90	10.77		..
13	.731	834			36.4	43.0	—		-	192	195	—		89	68	--		S W b S	S b E	N N E	N 11 W	5.8	10.4	5.5	1.23	7.77		.
14	.780	454	042	3792	35.3	38.0	50.7	41.52	+12.20	195	197	255	223	90	84	76	84	E b N	E N E	S S E	N 73 E	18.0	14.8	15.0	7.84	12.95	0.380	.
15	.140	.160	434	2717	38.9	40.2	32.8	37.45	+ 7.73	205	168	118	155	89	67	64	69	S S W	S W	W b N	S 78 W	12.0	18.4	20.9	17.86	18.91	Inap	Inap
16	.6[illegible]	.833	828	7909	33.6	41.1	35.0	36.40	+ 6.37	108	156	175	156	89	60	85	73	W N W	S b W	S b W	S 61 W	13.0	11.0	5.2	8.76	8.62		...
17	.774	685	440	5462	32.4	46.5	44.9	41.57	+10.92	161	153	164	166	67	57	74	65	S b W	E b S	E N E	N 80 E	2.8	8.6	5.4	6.66	7.06	0.285	
18	137	29 839	29 512	29 7805	42.4	47.6	50.7	46.03	+15.18	251	325	357	301	94	98	96	95	E N E	E S E	N b E	N 12 W	19.8	0.5	10.6	8.99	14.55	1.615	0.1
19	29.210	29.696	29.967	29.9920	32.4	32.1	31.0	31.73	+ 0.47	151	121	111	128	91	85	63	70	W N W	W N W	W N W	N 69 W	47.0	30.8	32.0	31.11	31.16		0.3
20	29.471	29.644	—		28.5	38.0	—		-	125	103		-	90	44	—	-	W b N	W b N	N b W	N 70 W	21.6	22.8	4.5	11.96	12.67		...
21	.781	675	579	29.6672	27.0	34.2	33.7	32.70	+ 0.62	137	138	131	133	93	69	67	72	N b W	E b N	E b N	N 73 E	1.0	13.2	7.3	9.09	9.28	0.250	..
22	.434	.417	528	4653	33.5	43.0	36.0	37.68	+ 5.20	177	220	201	203	92	79	96	90	NE b E	S S W	Calm	N 41 W	9.3	4.4	0.0	1.38	4.65	0.197	.
23	.[illegible]	.603	481	5635	30.6	48.9	38.6	40.53	− 7.77	146	179	163	159	95	51	69	69	N W	S	E N E	S 71 E	4.8	17.8	7.6	2.77	6.50	0.226	...
24	.387	.112	147	1539	41.3	51.6	46.2	46.43	+13.23	233	307	262	252	99	79	.83	90	E N E	S S E	N W b N	S 37 W	9.0	9.4	16.2	5.48	9.26	0.025	..
25	.1[illegible]	.100	383	2575	33.2	41.8	32.8	37.22	+ 3.65	156	191	134	165	90	72	72	73	S W b S	S W b S	W N W	W	7.6	12.2	15.0	11.46	12.79	.	Inap
26	.4[illegible]	.454	436	4475	27.7	33.0	32.1	30.96	− 3.00	128	092	102	112	84	46	.66	66	N W b W	W b S	W S W	S 60 W	17.4	7.8	3.6	4.59	6.64		0.2
27	.334	.333	—	—	23.6	35.0	—	—	—	139	140	—	—	88	64	—	—	NE b E	N E	E b S	N 77 E	4.9	2.8	1.2	8.79	4.13	.	0.3
28	.460	144	29.986	.1497	32.6	39.7	42.0	38.78	+ 4.07	168	202	244	209	89	82	91	87	NE b E	E b N	E	N 73 E	3.3	19.8	4.0	11.47	11.60	0.076	...
29	29.760	29.734	30.101	29.9469	45.4	43.6	35.7	41.37	+ 6.47	244	187	134	184	90	65	.63	.67	E b N	S W b W	W b S	S 64 W	12.8	29.5	19.7	24.96	19.97	0.137	...
30	29.251	29.380	418	29.3370	31.0	38.6	32.4	34.47	− 1.03	153	093	161	119	89	39	.86	61	S W b W	W	W	S 78 W	16.3	30.8	16.4	12.64	18.21	..	0.1
31	29.440	.236	.733	5870	31.9	36.8	31.3	33.33	− 2.68	137	119	133	130	75	55	.75	68	S W b W	W	W b S	N 80 W	8.0	33.2	6.6	14.31	14.75	..	0.2
M	29.[illegible]	29.5971	29.4161	29.4120	33.10	39.14	36.02	36.34	+ 5.90	.167	171	172	.169	.85	.69	.77	.78					10.30	18.04	8.68		10.89	4.064	1.0

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MARCH.

Highest Barometer........................... 30.255 at 8 a. m., on 2nd } Monthly range=
Lowest Barometer .... 28.286 at 5.40 a. m. on 19th } 1.969 inches

Self-registering Thermometers.
- Maximum Temperature .... 54°2 on p. m. of 24th } Monthly range=
- Minimum Temperature .. .. 9°8 on a. m. of 2nd } 44°4
- Mean maximum Temperature .... 42°10 } Mean daily range=
- Mean minimum Temperature .... 30°48 } 11°62
- Greatest daily range .... 20°9 from a. m. to p. m. of 23rd.
- Least daily range .... 2°4 from a. m. to p. m. of 19th.

Warmest day......... 24th ... Mean temperature......... 46.45 } Difference = 28°13.
Coldest day.......... 1st ... Mean temperature .... 18°32 }

Maximum { Solar.......... .... 69°4 on p. m. of 24th } Monthly range=
Radiation. { Terrestrial .... 2°9 on a. m. of 2nd } 66°5.

Aurora observed on 8 nights, viz., on 1st, 16th, 23rd, 24th, 28th, 29th, 30th, and 31st.

Possible to see Aurora on 17 nights; impossible on 14 nights.

Snowing on 6 days,—depth 1.0 inch; duration of fall 13.0 hours.

Raining on 15 days,—depth 4.054 inches; duration of fall 76.1 hours.

Mean of cloudiness = 0.65.

Most cloudy hour observed, 6 a. m., mean = 0.77; least cloudy hour observed, 10 p. m., mean, = 0.53.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1876.96	1336.51	2581.91	3890.01

Resultant direction N. 64° W.; Resultant Velocity 1.96 miles per hour.

Mean velocity............................ 10.39 miles per hour.
Maximum velocity .... 47.0 miles, from 5.30 a. m. to 6.30 a. m. on 19th.

Most windy day......................... 19th ..Mean velocity 31.16 miles per hour.
Least windy day .... 9th...Mean velocity 0.85 ditto.

Most windy hour ... . 1 to 2 p. m. ... Mean velocity 13.28 ditto. } Difference
Least windy hour, midnight to 1 a. m....Mean velocity 7.94 ditto. } 5.34 miles.

3rd—Rain and Hail mingled, from 10 a. m. to 3 p. m.
9th—Foggy, 7 to 8 p. m. Lunar Halo from 8 p. m.
10th—Lunar Halo from 6.40 to 7.30 p. m.
10th—Solar Halo from 10 a. m. (very perfect.)
13th—Lunar Halo, 3 to 4 a. m. Solar Halo, 9 to 10 a. m; both well defined.
17th—Fog 2 p. m. Sheet Lightning in S. W. 7.30 to 8 p. m.
18th—Violent storm of wind, continuing all day with great fury: Mean velocity
19th from midnight of 18th to midnight of 19th, = 34.57 miles per hour.
20th—Zodiacal light very bright at 7 p. m.
22nd—Solar Halo and Parhelion from 4 to 5.30 p. m. Dense Fog from 10 to 11 p. m.
24th—Thunderstorm, Lightning and Rain, 4 to 6 a. m. Solar Halo from noon to 1 p. m. Distant Thunder 5 to 6 p. m. and Sheet Lightning 8 p. m. to midnight.

The Resultant Direction and Velocity of the Wind for the month of March from 1848 to 1859 inclusive, were respectively N 60° W and 3.24 miles.

March, 1859, was the warmest and most rainy March for the last 20 years; the mean temperature exceeding the average by 6°27; and the depth of rain being more than double the mean quantity.

The Barometric reading at 5.40 a. m. on the 19th, was the *lowest* yet recorded at this Observatory: and the Mean Velocity of the Wind for the same day, the *highest*, during the last 13 years.

COMPARATIVE TABLE FOR MARCH.

Year.	Temperature.					Rain.		Snow.		Wind.		
	M'n.	Diff. from Aver.	Max ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
1840	°33.8	°+3.2	°56.9	°8 7	°48.2	8	1.640	8	...	..	...	... .
1841	27 7	—2 4	53.5	—6 9	60.4	6	1 170	7	...	...	...	0 61 lbs.
1842	35.8	+5.7	68 7	14.9	53.8	4	3.150	8	...	...	...	0 70
1843	21.3	—8 8	38 6	—2.8	41.4	2	0.625	18	25.7	...	...	1 18
1844	31.3	+1.2	50.3	9 6	40 7	8	3.470	8	14 0	..	...	0.57
1845	35.4	+5 3	61.7	9 9	51.8	5	impft.	8	2.8	...	...	0.66
1846	33.1	+3.0	49 3	7 6	41 7	9	1.985	5	3 8	..	...	0.30
1847	26 2	—3.9	44.3	4.8	39 5	5	0 850	6	4.2	...	...	0.71
1848	28 0	1.5	58 9	0 9	58 0	5	1.220	6	9 7	N 66° W	2.03	5 60 mls.
1849	33 5	+3 4	53 4	15 4	38 0	7	1 525	2	2 3	N 3° W	1 48	5 57
1850	29 8	—0 3	46 0	6.0	40 0	3	0 745	7	11 3	N 59° W	2 02	7 68
1851	32 4	+2.3	58 7	13.1	45.6	3	0 770	9	8.8	N 21° W	1 93	7.65
1852	27.7	2 4	44 8	—3.2	48 0	8	3 080	12	19.5	N 8° W	0 71	6.61
1853	30.6	+0 5	56.3	—0.1	56.4	6	1.090	8	7.1	N 66° W	2.60	5.90
1854	30 7	+0 6	52 8	10 4	42 4	9	2.425	3	2.8	N 53° W	5.39	8.05
1855	28 5	1 6	48.6	—2 9	51.5	5	1 485	11	18 1	N 88° W	4.76	9 98
1856	23.1	—7.0	39 3	—13 6	52 9	0	0 000	13	16 8	N 71° W	7 68	1. 80
1857	27 8	2 3	56.5	—3 9	60 4	4	0 335	15	11 8	N 63° W	6 85	10 81
1858	28 4	—1 7	54.1	—5 5	59 6	10	0 917	6	0 2	N 58° W	5.46	8 56
1859	36 8	+6 2	53.7	10 4	43.3	15	4 054	6	1.0	N 64° W	1.96	10.39
M	30.07	...	52.85	3.64	48.69	6.0	1.563	8.4	9 26	....	...	6.11 Ml

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—DECEMBER, 1856.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	30.304	30.301	30.355	—1.0	16.8	4.2	.034	.053	.038	84	53	73	W N W	S W	S E	22.25	5.21	0.30	.	.	.	Clear.	Clear.	Clear. Au. B.
2	.004	29.906	29.909	7.9	18.1	20.1	.048	.072	.091	77	75	.85	N N E	N N E	E b N	6.02	3.92	1.05	..	.	In'p.	Slight Snow	Cir. Str. 6.	C. Str. 10.
3	29.652	.694	.967	19.5	28.0	10.9	.097	.135	.064	92	.88	78	W	N E b E	W N W	0.22	1.10	12.81	...	...	1.10	C. Str. 9.	Snow.	Clear.
4	30.152	30.049	30.098	5.0	13.0	11.1	.029	.054	.057	82	.71	79	S E b E	N E b E	N E b E	0.56	0.35	4.27	...		0.96	Do. 8.	C. St. 10.	Snow.
5	29.941	29.692	29.574	8.0	18.0	26.0	.054	.088	.120	83	92	84	N E	N N E	W N W	13.87	12.57	8.30		.	...	Do. 10.	Sleet.	Rain.
6	.760	.950	30.125	30.0	22.0	18.8	.148	.084	.079	69	71	78	W	N N E	N N W	2.63	24.03	14.51		0.970	..	Do. 8.	C. St. 8.	Clear.
7	30.104	.941	29.700	5.7	22.1	33.0	.049	.090	.168	84	.78	89	E N E	E N E	S S E	0.20	8.62	6.37	..	..	.	Hoar-Frost.	Do. 8.	Snow.
8	29.601	.600	.724	32.0	30.2	21.0	.162	.142	.046	80	84	85	W	W b S	W	18.76	10.65	5.46	..	...	0.52	C. St. 10.	Do. 2.	C. St. 10.
9	.946	30.027	30.181	7.2	13.1	4.0	.049	.068	.040	81	81	80	W	W	W b S	29.81	14.51	10.86	..	..		Clear.	Clear.	Clear.
10	30.271	.174	29.914	5.1	17.6	20.1	.022	.072	.091	68	76	.85	S W	S S E	S b E	3.81	0.74	3.92		.	0.10	C. St. 10.	C. Str. 10.	C. St. 10.
11	29.901	29.960	30.174	19.1	22.0	7.2	.087	.101	.042	84	.80	70	W	W N W	W N W	9.20	14.05	9.60	.	...	..	Do. 4.	Clear.	Clear, ft. Au. B.
12	30.245	30.449	.403	7.5	11.0	5.2	.025	.042	.046	80	55	87	S b E	E b S	E N E	0.12	0.01	0.16	..	.		Clear.	C. Str. 6.	Cirr. 4.
13	.091	29.800	29.816	6.8	33.0	34.4	.049	.173	.190	88	94	95	N E b E	S S E	S S E	1.22	15.48	9.62	..	Inp.	0.70	Snow.	Rain.	C. Str. 10.
14	29.800	.610	.820	30.0	36.7	34.2	.154	.177	.182	90	89	96	N E	S W	S S E	0.10	0.11	0.73		0.012	.	C. St. 10.	C. St. 4.	Rain.
15	.497	.620	.720	34.0	36.1	28.6	.182	.191	.129	96	90	82	S W b W	S W	W	0.93	0.66	7.73	...	0.175	.	Rain.	Do. 9.	C. St. 2.
16	.861	.854	.900	21.4	38.1	28.5	.096	.199	.117	85	90	82	W S W	W S W	N N E	7.56	3.32	14.32	..	..	0.94	Clear.	Clear.	Snow.
17	30.150	30.142	30.265	4.1	21.0	1.2	.038	.090	.034	76	71	71	N E b E	N E b E	E b N	15.32	2.52	3.30	.	...	..	Do.	Do.	C. St. 10.
18	.380	.381	.443	6.6	5.2	—6.5	.021	.029	.026	80	56	80	N N E	S	S	9.63	0.60	0.20	.	...	.	Hazy.	Do.	Clear.
19	.414	29.964	29.797	—10.7	1.9	6.0	.021	.040	.054	77	85	88	E b N	N E b E	N E b E	3.22	9.76	8.70	...	...		Cir. Str. 10.	C. St. 8.	Snow.
20	29.794	.842	.961	13.0	32.2	12.2	.066	.143	.066	90	.79	89	W S W	S W b W	S W	1.63	2.45	13.72	..	...	1.90	Do. 4.	Clear.	Clear.
21	.738	.460	.854	10.4	15.2	17.8	.059	.070	.088	89	82	92	N N E	N N E	N N E	0.63	1.11	18.37	..	..	5.40	C. St. 10.	Snow.	Snow.
22	.307	.476	.864	20.0	21.8	5.8	.097	.090	.035	.92	78	61	W N W	W b N	W N W	18.57	20.94	21.31	...	..	1.10	Do. 9.	Cl. Str. 9.	C. St. 9.
23	.840	.874	30.004	—2.5	5.5	1.5	.032	.035	.040	85	61	86	W S W	S E	S E	10.55	0.01	0.01	...	...	..	Do. 6.	Do. 9.	Do. 9. [Z. lt.
24	30.070	30.214	.425	8.9	12.4	4.0	.024	.031	.031	79	69	.80	W S W	W S W	S W b S	0.00	0.00	0.00	..	...	...	Cirr. C. 4.	Clear.	Clear Au. Bor.
25	.648	.640	.645	—14.2	12.1	—9.7	.018	.051	.022	74	70	76	S S W	S S W	W S W	0.00	0.03	0.01	..	.	...	Clear.	Do.	Do. Zod. light.
26	.205	29.945	29.847	—10.2	13.0	10.6	.022	.039	.062	.78	60	69	N E b E	E N E	E b S	0.00	0.00	0.00	...	...	...	Do.	Do.	C. St. 10.
27	29.694	.700	.839	10.1	29.2	21.7	.054	.128	.090	.78	77	78	S b E	W N W	W b N	4.30	7.02	5.83	.	...	1.01	Snow.	C. St. 8.	Clear.
28	.979	30.049	30.081	10.0	13.7	4.0	.057	.057	.038	.79	72	76	W N W	W N W	W	12.97	12.90	4.41	...	...	...	Clear.	Clear.	Do.
29	30.078	.090	.237	—12.0	11.0	—15.2	.020	.042	.104	76	.59	69	E	S b E	E	0.11	1.38	0.02	...	...	...	Do.	Do.	Do. Au. B.
30	.529	.290	.211	—17.6	1.6	2.8	.014	.034	.042	70	72	.82	E b N	E b N	W	14.10	11.49	15.62	...	...	...	Do.	Do.	C. St. 10.
31	29.967	29.680	29.847	18.5	31.0	30.1	.098	.155	.148	92	.90	.80	E S E	S S E	S b W	19.00	13.79	13.92	...	0.016	2.46	C. St. 10.	Snow.	Do. 10.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—JANUARY, 1859.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr. 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	Tension of Vapor. 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour 6 A.M.	2 P.M.	10 P.M.	Mean direction of Wind	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	29.662	29 714	29 931	32 0	39 0	21 7	162	216	000	89	91	78	W S W	W S W	N W b N	2 41	5 23	19.90				C St 6.	C. St. 6.	Clear.
2	30.169	30 225	30 374	7 1	21.6	0 4	045	080	036	76	71	82	N N W	S S W	E S E	13 40	0 72	1.04	.	.		St. 8.	Clear.	Do.
3	416	280	267	-3.6	11 9	4.1	031	051	036	83	70	.72	N E b E	N E b E	N E b E	6 70	8 62	7 18	..			C. St. 10.	Do.	Do.
4	.041	29 942	29 614	8 9	24 1	22.4	051	112	101	77	85	86	N E b E	N E b E	N E b E	10 21	1 54	0 76	..		0.06	Do. 10.	Clear.	C. St 10.
5	29 621	.679	694	26.4	39 2	35.4	117	201	170	82	86	82	N E b E	S b E	S b E	1 22	1 08	2 12				Do. 10.	C St. 4.	Do, 6.
6	870	30 000	30 094	12 0	32.1	18 0	.168	162	077	89	94	78	S W	W b N	W b N	23 52	8 60	9 77	..			Do. 10.	Do. 4.	Do. 10.
7	.977	29.916	29 474	17 1	36 7	21 7	.072	191	090	78	90	78	N E b E	N E b E	W b N	14 22	1 46	0 61	..	0.031	2 16	Snow.	Snow.	Rain.
8	676	734	.869	4 1	1.9	12 6	031	034	018	83	84	74	W b S	W b S	E N E	36 62	13 26	16 33			...	C. St. 10.	C St. 4.	Clear.
9	30 249	30.228	30.480	-29 9	-21 5	-32 1	008	010	003	60	63	68	E N E	E N E	W b N	14 77	8 98	3 03	.	.	...	St. 2.	Clear.	Do. Aur Bor
10	614	.520	522	-43 6	-14.3	-29 2	000	017	004	47	73	.62	W S W	S W b S	S W b S	0 20	0 01	0 08	...		..	Clear	Clear.	Do, Aur. Bor.
11	.425	.396	523	-37.1	19 9	-21 6	.001	012	011	58	67	64	E N E	N E b E	S b W	0 13	0 01	0 02	.	..	-	Do.	C. St 9	Do Aur. Bor.
12	.006	29 976	29 928	-18.4	-10 4	5 0	077	021	022	57	70	70	N E b E	N E b E	N E b E	24 61	14 45	11 70	...	.		Do.	C. C. St. 6.	Snow.
13	29 731	.834	30 009	-8 1	12 2	10 9	025	060	048	66	80	69	S E b E	S b W	E b N	9 62	0 78	0 48		..	1 10	Snow	C. St. 10.	C. St. 10.
14	.871	.787	29 632	8.5	15 6	17 8	039	070	088	89	80	.92	N E b E	N E b E	N E b E	10 86	10 01	14 90	.	.	1 10	C. St. 10.	Snow.	Snow.
15	526	127	249	19 7	26 3	21 3	096	135	109	90	90	96	N E b E	N E b E	N E b E	20 27	0 06	7 77	.	Inp	2 30	Rain	Do.	C. St. 10
16	.674	746	979	16 1	19 0	14 3	079	077	074	84	76	91	W S W	W S W	S	19 95	8 22	10 81	.		0 24	C. St. 10.	C. St. 8.	Do. 10.
17	.856	967	30 157	12 9	16 8	1 0	063	068	038	82	78	85	N E b E	N E b E	N W b W	6 00	12 05	1.35	...	...	0 47	Snow.	Do. 8.	Clear.
18	30 314	30 216	.137	-10 6	15 0	13 5	021	070	072	77	82	91	N N W	S b W	S b W	0 95	7 73	2 77		...	Inp.	Clear.	Do.	C. St. 10.
19	048	020	008	12 5	24 2	19 2	069	094	087	90	73	84	S E b E	N E b E	N E b E	1 02	0 00	1 78	..		Inp.	C. St. 10.	Do 8.	Do. 6.
20	29 925	29 817	29 614	10 6	4 4	32 7	089	169	156	88	84	85	N E b E	S b E	S b E	0 57	0 01	6 22	..	..		Clear.	Clear	Do. 6.
21	597	619	.724	36 0	38 8	34.2	197	207	169	95	84	85	S W b S	S W	S W	7 01	5 43	8 67	..	0 210		Rain.	C. St. 9.	Do. 10.
22	821	828	30.085	16.0	16 2	5 0	082	060	041	84	80	71	E b N	W	W N W	9 06	0 35	18 81		...	Inp.	Snow	Do, 10.	Clear.
23	30.250	30 259	.324	-4.1	8 0	7.4	031	048	05	83	.77	87	S b W	S b E	S	9 52	0 00	0 92	..	.	..	Clear.	Clear.	Do.
24	297	.274	.207	6 4	27.6	17.9	046	129	072	50	88	.85	S b E	S E b S	S b E	1 47	11 16	0 30	.	...		C. St. 6.	Cirr. 2.	Do. Zod. Lt. & Br
25	251	.164	.107	10 9	29 4	24.8	060	136	111	80	83	86	N N W	S E	S b E	0 81	0 11	0 20		.		Do. 2.	Clear.	D. do. do.
26	.080	078	087	23 4	39 1	33 2	108	180	156	80	.77	86	S S W	S W b S	S W b S	1 20	5 65	15 05	.	...	...	Do. 4.	C. O. St 6.	C. St. 10.
27	247	312	130	10 5	20 1	10 1	062	075	084	89	70	79	E S E	N E b E	N E b E	8 52	6 20	2 90	.		.	Clear.	C. St. 6.	Snow.
28	29 868	29 762	29 846	11 0	19 0	20.0	087	087	091	79	.84	85	N E b E	N E b E	N E b E	30 05	17 00	12 20	..	Inp.	7 30	Snow.	Rain.	C. St. 10.
29	866	900	924	19 1	27 4	24.2	087	141	096	86	96	73	E	S b W	S S W	4 92	0 00	0 20	...	...	..	C. St. 10.	C. St. 6.	Do. 10.
30	978	30 084	30 206	16 2	20 2	13.9	072	080	068	82	78	81	W	W	S W	17.63	13.30	1 06	.	...	..	Clear.	Cirr. 4.	Clear Z. Lt. & Br.
31	30.380	.199	.220	-3.9	25.7	8.0	031	111	048	.83	.80	79	S E b S	S S E	S S E	1 00	0 00	0.00	...	...	...	Do.	Clear.	Do. do. do.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR DECEMBER, 1858.

Barometer	Highest, the 25th day	30.548
	Lowest, the 22nd day	29.307
	Monthly Mean	30.018
	Monthly Range	1.241
Thermometer	Highest, the 15th day	36°.4
	Lowest, the 30th day	—17°.9
	Monthly Mean	12°37
	Monthly Range	54°.3
Greatest intensity of the Sun's Rays		40°.4
Lowest point of Terrestrial Radiation		—17°.9
Mean of Humidity		.787

Rain fell on 5 days amounting to 1.176 inches; it was raining 39 hours 15 minutes.
Snow fell on 12 days amounting to 16.19 inches; it was snowing 70 hours 10 minutes.
The most prevalent wind was N. E. b E.
The least prevalent wind E.
The most windy day the 9th; mean miles per hour 18.39.
Least windy day the 24th; mean miles per hour 0.00.
Aurora Borealis visible on 4 nights.
The electrical state of the Atmosphere has indicated high intensity.
Ozone was present in rather large quantity.
Zodiacal Light visible.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR JANUARY, 1859.

Barometer	Highest, the 10th day	30.614
	Lowest, the 15th day	29.127
	Monthly Mean	30.021
	Monthly Range	1.487
Thermometer	Highest, the 26th day	39°4
	Lowest, the 10th day	43°6
	Monthly Mean	10°9
	Monthly Range	83°0
Greatest Intensity of the Sun's Rays		40°0
Lowest point of Terrestrial Radiation		43°6
Mean of Humidity		.792

Rain fell on 4 days, amounting to 0.231 inches; it was raining 21 hours and 35 minutes.
Snow fell on 11 days amounting to 14.73 inches; it was snowing 67 hours and 5 minutes.
The most prevalent wind the N.E. by E.
The least prevalent wind was E.
The most windy day was the 8th; mean miles per hour, 22.73.
The least windy day was the 10th; mean miles per hour, 0.08.
Aurora Borealis visible on three nights.
The electrical state of the atmosphere has indicated high intensity.
Ozone was present in large quantity.

THE CANADIAN JOURNAL.

NEW SERIES.

No. XXII.—JULY, 1859.

OF SOME OF THE SUPERSTITIONS AND CUSTOMS COMMON AMONG THE INDIANS IN THE VALLEY OF THE ASSINIBOINE AND SASKATCHEWAN.

BY HENRY Y. HIND, M.A.

PROFESSOR OF CHEMISTRY AND GEOLOGY, TRINITY COLLEGE, TORONTO.

Read at the President's Conversazione, of the Canadian Institute, 27*th April*, 1859.

One result of the active pursuit of the fur trade for upwards of a century in the valley of the Saskatchewan, is seen in the blending of different tribes by intermarriage. The Crees of the Plains and the Ojibways and Swampys of the Woods, although speaking different languages, are often found hunting the buffalo in company and not unfrequently form family connections. The Ojibways of Lake Winnipeg may now be discovered, summer and winter, near the Grand Forks of the Saskatchewan, having emigrated four hundred miles west of Red River, where they have permanently established themselves. All the Ojibways now found west of the Lake of the Woods are invaders of the country. The real home of the Ojibway is the region about the south and west of Lake Superior. Their habits of life have changed with the character of the country the emigrants or invaders

now occupy. They are no longer dependant upon the forest for their supply of food and clothing; but many of them, on the banks of the Assiniboine, Red River, and Lake Manitobah, possess horses and join the half-breeds in their annual spring and fall hunts. Notwithstanding this intercourse and blending of different tribes, most of the superstitions and customs peculiar to each are still maintained and practised.

It is often asked whether the thrilling descriptions of savage life, as given in Cooper's delightful romances, are imaginary or real; and, if real, whether they exist now among the tribes which have long been familiar with civilized man, such as the Plain Crees, the Sioux, the Swampys, and the Ojibways. It is enough to visit the secluded Ojibway graves, on the banks of the Red River, and behold there Sioux scalps decorated with beads, bits of cloth, coloured ribbons, and strips of leather suspended at the extremity of a long slender stick near the head of the grave, to feel satisfied that one barbarous custom still prevails. But to be an eye witness of a scalp dance or a skull dance is more than enough to press home the conviction that the fiendish passions, so faithfully described by Cooper, still find expression in violent gesture, loud vociferation, triumphant song, and barbarous feasting with undiminished strength and bitterness, even after a century's intercourse with civilized men.

In the following pages, I shall endeavour to describe some incidents which will show how far old superstitions and customs prevail among the Indians occupying the country I visited last summer, between Red River and the south branch of the Saskatchewan.

Early last spring, the warlike bands of Ojibways, called the Lac la Pluie Indians, were thrown into a state of savage excitement by the arrival of messengers from their friends on the Red River, with tidings that two Sioux had been killed and scalped in the Plains. In testimony of this triumph, they brought with them two fingers severed from the hands of the unfortunate Sioux. The announcement of the intelligence that the scalps would be sent after their Red River brethren had celebrated war dances over them, was received with wild clamour and shouting. After the scalps had been carried from hand to hand and the victory that won them triumphed over with dancing, singing, and feasting, they would be returned to the warriors who took them, and finally suspended over the graves of relatives or friends mourning the loss of any of their kindred by the hands of the Sioux.

The wood Indians assemble in the spring to celebrate their medicine and other notable ceremonies. During the summer they separate into families or small bands, and hunt, fish or go to the Plains in search of buffalo. At the approach of winter, they "take debt" or otherwise obtain supplies at the different posts of the Company, and retire to their winter quarters to trap the fur-bearing animals. The Plain or Prairie Indians follow the buffalo, and vary the monotony of their existence by forming war parties against their enemies, such as the Plain Crees against the Sioux and the Blackfeet, the Ojibways against the Sioux.

When on the south branch of the Saskatchewan last August, we found the Plain Crees hastening from the west to the east bank of the river, at the Elbow, with a strong war party of Blackfeet in pursuit. The chief of the Crees of the Sandy Hills, near the south branch, Short-stick by name, pointed out some of his band who had penetrated through the Blackfeet country to the Rocky Mountains two years ago, and returned with several scalps, grizzly bear claws, necklaces, pipes, and other trophies of success; he also related with much feeling how twenty-five young warriors had gone on a similar excursion the summer before last, but none had yet returned. Last July, the Plain Crees met a portion of the Blackfeet tribe, at the Eagle Hills, on the north branch of the Saskatchewan, to arrange terms of peace. All matters went on smoothly and the tribes separated as friends. Some of the Crees, however, incapable of resisting the opportunity, stole some horses from the Blackfeet. They were pursued, and three of them taken. One was killed instantly, the others were led back in triumph to the camp of the Blackfeet. They were stripped, their hands were tied behind their backs, a hole bored through both wrists and a stick passed through them and so tightly fastened that it could not be removed without assistance. The captives were then separated and dismissed singly to find their way to their friends. One only reached his tribe and was lying in a tent which we passed on the banks of the Qu'apelle, near the south branch.

The chief "Short-stick," when relating these adventures, held up the pipe he had in his hand and exclaimed, "this is what my Blackfoot friend gave me one day, the next he killed my young men; he is now my enemy again." I expressed a wish to purchase the pipe; the chief's reply was "take it," handing it to me with a gloomy frown, and silently extending his hand for the common "clay" which

I was smoking at the time. The great chief of the Plain Crees is styled "the Fox;" he is well figured in a photograph. "The Fox" is held in high esteem by all the Plain Indians with whom he comes in contact, either in peace or war. He is dreaded by the Sioux, the Blackfeet, the Bloodies, the Fall Indians, the Assiniboines, and all the tribes who occasionally hunt on the Grand Coteau de Missouri and the south branch of the Saskatchewan.

The cruel, barbarous treatment of prisoners so often described in narratives of Indian warfare, is common even now in the prairies south of the Qu'appelle or Calling River and the Assiniboine. Not a year passes without two or more of the Red River half-breeds being scalped by Sioux: sometimes, as was the case last year, quite close to the settlement of St. Joseph, on the boundary line, about 30 miles west of Red River. When a prisoner is taken, the Sioux sometimes adopt a terrible mode of death, during the summer season. They have been known to strip a half-breed, tie him to a stake on the borders of a marsh in the prairie, and leave him exposed to the attacks of millions of mosquitoes, without being able to move any part of his body; and when the agony of fever and the torment of thirst come upon him, they leave him to die a dreadful lingering death, with water at his feet, and buzzards hovering and circling around him in loathsome expectation. By way of illustrating the character of the medicine or conjuring ceremonies, which may be witnessed during all seasons of the year, when several families are encamped together, I shall describe a scene of which I was an eye witness last summer near the Hudson Bay Company's post in the Touchwood Hills, between the south branch of the Saskatchewan and the Assiniboine. The conversation was carried on in Cree, but, I believe, faithfully interpreted to me by the officer then in charge of the post, who was present. The interpretation was pronounced exact by one of the Cree half-breeds attached to my party.

At the time of my arrival at this Post, a conjuror of some celebrity was endeavoring to cure an invalided woman by the exercise of his cunning. The sick woman was lying in a buffalo skin tent; the conjuror, painted and decorated, employed himself in beating a medicine drum within a few feet of her, and in singing at intervals the following words, first uttered slowly, with a pause between each word, then as in ordinary conversation; lastly, with energy and rapidity:

"Great—is—the—man—who—walks—
In—the—middle—of—the—Earth,—
He—is—the—only—true—Lord."

The word "Lord" is not employed in the sense of supreme master, but is rather intended to convey an idea of independence and individual power; and is better expressed in English, as the half-breeds informed me, by the word "gentleman."

The conjuror occasionally came out of the tent; and whenever the supposed Manitou or Fairy who was the alleged cause of the woman's illness approached, a little bell, suspended from the poles supporting the tent, tinkled, and gave the alarm; the conjuror immediately seized his drum, commenced his song, and, by his incantations, succeeded in pacifying the Manitou. These proceedings continued for two nights; and, at the close of the second night, after a prolonged ringing of the little bell, violent shaking of the tent poles, loud beating of the drum, and chaunting of the words before quoted, the conjuror announced that he had discovered the reasons of the Manitou's anger, and the means to appease it.

You had a dream, said the conjuror, and when you rose in the morning you promised to make an offering to the Manitou, you have forgotten your pledge, and you are sick.

The woman demanded what she had dreamt, and what she had promised, avowing her ignorance of both dream and promise. But the conjuror told her, that when the buffalo were around her tent last winter, and no fear of starvation before her eyes, she had dreamed that the buffalo would always surround her, that famine and sorrow were always to be strangers to her, and, in gratitude, had vowed to make a sacrifice of her best robes. The woman, wearied no doubt with the conjuror's unceasing drum and song, probably too, believing that a false confession was the lesser evil, as it might bring the promised relief, acknowledged that the conjuror was in the right. The penalty she was told to pay consisted of the sacrifice of throwing away of two robes, or double the amount of the promise she had made, after which her health was to be restored.

Scenes similar to the one just described may be witnessed whenever several families are camping together; but the sacrifices required to be made depend upon the ability of the deluded creatures to satisfy the demands of the conjuror.

"The Happy Hunting Grounds," the Heaven of Indians, so often

spoken of by writers of fiction, are an actual reality in the imaginations of Crees and Ojibways, as well as of other north-western tribes. A plain Cree on the Qu'appelle gravely informed one of my men that he had been dead once, and visited the spirit world. His narrative was to the following effect:—"I was sick, and fell asleep. I awoke on the bank of a deep river, whose waters were flowing swiftly and black from a great mist on the south to a great mist on the north. Many other Indians sat on the banks of the river, gazing on its waters, and on the gloomy shore which lay wrapped in mist on the other side. Time after time the mist before us would roll away and reveal the mouth of another great river pouring its flood into the one on whose banks I was sitting. The country to the south of this river was bright and glorious, to the north dark and gloomy. On the one side was the happy hunting grounds, on the other the hunting grounds of the bad Indians. Time after time my companions tried to cross the swift stream before us, in order to reach the happy hunting grounds; some arrived in safety, others reached the north bank, and disappeared in the mist which overhung the bad country. I tried at last, but the current was too strong for me, the recollection of bad deeds prevented me from stemming the current, and I was swept on to the north shore of the opposite river. I scrambled up the bank, and spent many moons in hunting in that dreary land; always on the point of starving, or of being hurt by enemies, or wet and cold and miserable. At length I came upon a river like the one I had crossed, with mists and a great stream opposite, breaking clouds revealing happy hunting grounds on one side, and a more gloomy and terrible country on the other side. Other Indians were there before me, looking at the river and trying to cross; many succeeded, a few were swept to the bad country, these were very wicked Indians. I tried to cross. I knew I had been a good Indian in this dreary hunting ground. I took courage, and swam strong against the stream. I reached the happy hunting grounds; all my sorrow disappeared as I climbed to the top of the bank and saw before me Indians numerous as grass leaves, buffalo on the distant plains thick as rain drops in summer, a cloudless sky above, and a warm, fresh, scented, happy breeze blowing in my face. I sank to sleep, and woke alone in my tent in these prairies again."

Whatever faith the Indian medicine men possess in the efficacy of their charms, it is certain that they entertain great respect for the

white man's medicine. A laughable incident occurred at the Touchwood Hills. The conjuror of whom mention has just been made, entered the room at the post where I was sitting with Mr. and Mrs. H., who were temporarily in charge. The Indian and a companion seated themselves upon one of my boxes which contained a small medicine chest. Mrs. H. asked me to give her some sticking plaster. I crossed the room to open the medicine chest, when Mrs. H. (a half-breed) said to her husband, in the Cree language: "Will his medicine do me any harm if I stop here while he opens them?" Mr. H. answered jestingly, "yes, you had better go into the other room." I motioned the Indians to move, they rose, and I opened the chest; the moment they saw the bottles they hurried out of the room, hastened to the summit of a neighboring hill, and divesting themselves of every article of clothing, shook their garments repeatedly, and, after hanging them on bushes in the sun, squatted on their haunches to await the deodorizing influence of the breeze.

In the valley of the Qu'apelle River, we frequently found offerings to Manitou or Fairies suspended on branches of trees; they consisted of fragments of cloth, strings of beads, shreds of painted buffalo hide, bears' teeth and claws, and other trifles. Our half-breeds always regarded them with respect, and never molested or liked to see us molest these offerings to Manitou. This custom prevails everywhere in the valley of Lake Winnipeg, and it may truly be said that the Medicine drum is heard far more frequently in some parishes of Selkirk Settlement than the sound of church bells.

A conjuror celebrated for the potency of his charms will often exercise a very injurious influence over an entire band consisting of ten or twelve families, in deterring them from frequenting particular hunting or fishing grounds if they offend him. Out of numerous instances of this dangerous influence, I select the following. It occurred on the Dauphin River. When ascending that stream, we came upon a large camp of Ojibways who were on their way to the Hudson Bay Company's Post, at Fairford. Their usual wintering place was at the Pike's Head, an excellent fishing station, on Lake Winnipeg; but they had abandoned the intention of wintering there in consequence of a threat which had been conveyed to them from a noted conjuror of the Grand Rapids of the Saskatchewan, to the effect that if the band ventured to winter at the Pike's Head, "He would do something." This ambiguous threat was quite sufficient to

deter them from visiting their old haunts, and would probably be instrumental in producing much suffering if not actual want to many of the band.

Sacrifices and offerings are of very frequent occurrence among the Indians of the Saskatchewan Valley. The customary offerings consist of two, three and sometime five dogs. At the mouth of the Qu'apelle River, an Indian, in June last, set his nets and caught a large fish of a kind different to any with which he was familiar. He immediately pronounced it to be a Manitou, and, carefully restoring it to the water again, he at once sacrificed five valuable dogs to appease the anger of the supposed fairy. On approaching Long Lake, an arm of the Qu'apelle River Valley, the Crees warned us not to visit the Lake by night, as it was full of devils. They told me very extraordinary tales of the dimensions and power of these devils, and appeared to live in awe and terror of them. Like most heathen and barbarous races, the Indians suffer much from their superstitious fears. When the weather is fine and their tents are well supplied with provisions, they are an independent and joyous people. Full of frolic, and fond of relating anecdotes, they laugh immoderately at any trifling joke or absurdity, and seem thoroughly to enjoy existence. A ridiculous incident occurred in the tent belonging to the chief, Short-stick, in which I played a more prominent part than I should have selected had any choice been offered me. I heard of this incident again hundreds of miles from the spot where it occurred as we journeyed homewards from the Grand Forks.

It happened thus. I visited Short-stick in his tent after a long and tedious talk which lasted seven hours, relating to the object we had in view in visiting the country. Three of Short-stick's wives were visible with their children, forming altogether a party of eighteen or twenty. I rose from the buffalo robe where I was seated by the side of Short-stick to examine some arrows which one of his sons was making, and when my curiosity was satisfied, I sat down on what I thought to be a bundle of buffalo robes. I was a little astonished to feel the robes move beneath me, and before I could rise and look into the cause, I found myself projected into the middle of the tent among the embers, by means of some violent spasmodic action from beneath the supposed pile of robes. Short-stick and his three wives with the other inmates, shrieked with laughter, vociferating some words in Cree. Meanwhile, the buffalo robes were slowly thrown on one side, and, to my aston-

ishment, were revealed the huge proportions of Short-stick's fourth, youngest and best wife. She shook a mass of hair from her head and joined in the laughter at my discomfiture. Other Indians hearing the noise came in, and Short-stick, with tears in his eyes, told his friends how "the white stranger had sat upon his best wife, thinking she was a pile of robes, and how she tossed him into the middle of the tent like a buffalo bull pitching a colt."

As I passed near the door of the tent belonging to Short-stick's eldest son, who accompanied me, a young squaw outside was leaning upon sticks, evidently in great trouble and weeping bitterly; the moment she saw us she hobbled into the tent with a low cry of pain and closed the entrance. I asked the interpreter what this meant. After some conversation with her husband, he said that the woman was suffering from a beating he had given her for a violation of her faith during his absence in the spring on a war excursion. "I would have killed her," muttered the husband, "but I thought it a pity to kill two at once. She had her choice whether she would have her hair, her nose or her ear cut off, or whether she would have a beating; she chose what she has got, and I would have killed her had I not known I should regret having killed both." It is needless to add that the woman soon expected to become a mother.

In order to understand the character and nature of wild Indians, they must be seen in their tents when well supplied with provisions, and disposed to be cheerful and merry. In the prairies, on horseback, they are often quiet and watchful, always on the look out, and if twenty or thirty are in a band they generally manage to see a suspicious object in the distance at the same moment, so that a simultaneous note of exclamation is uttered by most or all of the party. In hunting the buffalo they are wild with excitement, but no scene or incident seems to have such a maddening effect upon them as when the buffalo are successfully driven into a pound. Until the herd is brought in by the skilled hunters all is silence around the fence of the pound, each man, woman and child holding, with pent up feelings, his robe so as to close every orifice through which the terrified animals might endeavour to effect an escape. The herd once in the pound the scene of diabolical butchery and excitement begins; men, women and children climb on the fence and shoot their arrows or thrust their spears at the bewildered buffalo, with shouts, screams and yells horrible to hear. But when the young men, and even women jump into the arena

amidst the dying and the dead, smear themselves with blood, thrust their arms up to the shoulders into the reeking bodies of their victims, the savage barbarity of the wild prairie Indian shows itself in its true colours. Not even a scalp dance over many fallen foes affords such a terrible picture of degraded humanity as do a large band of prairie Indians, some hundreds in numbers, during and after the slaughter of buffalo in the pound.

The condition of the Indians now is very different to what it used to be half a century since. Not only have imported diseases greatly diminished their numbers, but game of different kinds has become so scarce that during some seasons starvation is no fiction.

In sickness prairie Indians are much depressed, and often seek consolation in the monotonous drum of the medicine man and his heathenish incantations, an infliction which the grossest and most debased superstition alone would tolerate; submitted to with hope and confidence, however, by men who are anxious and timid during the roll of thunder, invoking the Great Bird by whose flapping wings they suppose it produced, or crouching from the blink of his all penetrating eye, which they allege is the lightning flash.

CONTRIBUTIONS TO METEOROLOGY, FROM OBSERVATIONS TAKEN AT ST. MARTIN, ISLE JESUS, CANADA EAST.

BY CHARLES SMALLWOOD, M.D., LL.D.

PROFESSOR OF METEOROLOGY IN THE UNIVERSITY OF M'GILL COLLEGE, MONTREAL.

Read before the Canadian Institute, 9th April, 1859.

The following observations extend over the year 1858: The Geographical co-ordinates of the Observatory are Latitude 45°32′, North, and Longitude 73°36′, West, from Greenwich. The cistern of the Barometer is 118 feet above the level of the Sea, the Mean Results are obtained from tri-daily observations taken at 6 a.m., 2 p.m., and 10 p.m., and the whole of the observations have been subjected to the usual corrections, depending on the constructions of the instruments and for temperature.

Barometric Pressure.—The highest reading of the Barometer during the year, was at 10 p.m., on the 22nd of January, and indicated 30.697 inches. The lowest reading for the same period occurred at 2 p.m., on the 21st of March, and was 29.021 inches, giving a yearly range of 1.676 inches. The greatest monthly range was in January, and this holds good for a series of years, with the exception of last year, 1857, when December indicated the greatest monthly range. June of the present year indicated the lowest monthly range, 0.660 inches, although July for a series of years has indicated the least monthly range. This year July exceeded by 0.014 the lowest range of June. The mean barometric pressure for the year was 29.829, which exceeds by 0.071 inches the mean of last year, and shows an increase in pressure of the atmosphere compared with a series of years. The mean height of the barometer for the month of January was 29.907 inches; for February, 29,809 inches; for March, 29.804 inches; for April, 29.757 inches; for May, 29.751 inches; for June, 29.771 inches; for July, 29.759 inches; for August, 29.789 inches; for September, 29.830 inches; for October, 29.982 inches; for December, 30.015 inches. The mean monthly range of the barometer for the month of January was 1.627 inches; for February, 1.129 inches; for March, 1.340 inches; for April, 0.947 inches; for May, 1.039 inches; for June, 0.660 inches; for July, 0.674 inches; for August, 0.714 inches; for September, 1.221 inches; for October, 1.032 inches; for November, 0.856 inches; and for December, 1.241 inches.

The greatest range within twenty-four hours, with a rising column, occurred on the 21st January, and was 0.730 inches; and the greatest range, with a falling column, was on the 10th of January, and indicated 0.903 inches. The most sudden variation, with a rising column, occurred on the 18th June, and from 3 p.m. to 3.20 p.m. (*twenty minutes*) indicated a rise of 0.075 inches. The *Symmetrical wave of November* exhibited but little fluctuation, the final trough terminated at 6 a.m. on the 30th day.

Temperature of the Atmosphere.—The mean temperature for the year was 40°.04 Fahrenheit, which shows a decrease in temperature of 0°.53 compared with the temperatrue of 1857, and indicates 1°.520 less than the mean temperature for a series of years. The lowest observed temperature was on the 13th of February, and indicated 30°.2 below zero. The highest temperature occurred on the 7th of July, and was 99°.3, giving a yearly range or climatic difference of

129°8. *February* was the coldest *February* on record here, and indicated 14°05 colder than the mean of last February, 1857. The highest degree of temperature for the month was 39°.4, and the lowest 30°.2 below zero. The most sudden decrease of temperature occurred on the 18th of June, and indicated in twenty minutes a decrease of 17°.1; the thermometer standing at 3 p.m. at 93°8, and at 3.20 p.m. 76°.7. The mean temperature of the air for the month of January was 13°.76; for February, 7°.56; for March, 23°52; for April, 39°.06; for May, 63°.02; for June, 67°.21; for July, 66°.50; for August, 66°.12; for September, 59°.13; for October, 46°48; for November, 26°78; and for December, 12°.37. July which has for a series of years indicated the greatest *mean* temperature showed this year 0°.71 less than the *mean* temperature of June. This was owing to the low temperature accompanying the excessive rain of the month of July.

Humidity.—The relative mean humidity of the atmosphere for the year (saturation being 1,000) 0.778. July indicated 0.074 of moisture more than the *mean* of a series of years. The mean humidity for the month of January was .786; for February, .703; for March, .789; for April, .717; for May, .764; for June, .756; for July, .818; for August, .818; for September, .804; for October, .792; for November, .809; and for December, .787. Complete saturation occurred in July, and is the only instance on record here of such an occurrence.

Rain fell on 111 days, amounting to 50,035 inches on the surface. It was raining 521 hours 33 minutes, and was accompanied by thunder and lightning on 20 days. This amount of rain exceeds by upwards of 7 inches the usual average amount compared with a series of years, and was owing to excessive rains in June and July.

A very heavy storm occurred on the 10th of June, which lasted 28 hours and 48 minutes, and amounted to 6.175 inches. There fell in one hour (from 5 to 6 p.m.) 0.933 inches, and from 6 p.m. to 7.28 p.m. the amount of 1.333 inches. The river surrounding this Island rose 8 inches in height.

Another storm of heavy rain set in at 3 a.m. on the 12th day of July, and ceased at 12.40 p.m. of the 13th, and indicated a depth of rain on the surface of 6.374 inches; it was accompanied by a N.E. by E. wind. The river in the neighborhood rose nearly 2 feet in perpendicular height, and the amount of rain which fell during this month was

12.214 inches, and is the most rainy *July* on record. The amount of rain which fell in the month of August was less than the usual mean quantity for that month.

Snow fell on 46 days, amounting to 58.96 inches in depth; it was snowing 281 hours, 30 minutes; this amount shows a decrease equal to 36.80 inches compared with the mean amount of a series of years. February and December were the months which showed the greatest amount of snow. The first snow of the season fell on the 4th of November, and the last snow of spring fell on the 21st April.

Evaporation.—The amount of evaporation from the surface of water, during the seven months which the observations are recorded (owing to the presence of frost) amounted to 18.730 inches, which is 1.515 inches less than the amount of last year. July indicated about 1 inch less than the usual amount; the amount of ice evaporated during the remaining months of the winter season showed about the usual average amount.

Wind.—The most prevalent wind during the year was the N.E. by E. The next in frequency the W. by N., and the least prevalent the S. The aggregate amount linear in miles run was 41,338.60 miles, which shows a decrease of 13,086.50 miles compared with last year, and a decrease of 11,723.03 miles compared with 1856. The yearly mean velocity was 4.613 miles per hour, which is 1.567 miles less than the mean annual velocity for 1857. The maximum velocity was 37.70 miles per hour. January was the most windy month, and September the calmest.

The greatest *Intensity of the Sun's Rays* was 117°, and the lowest point of *terrestrial radiation*, 31°.2 below zero.

The yearly amount of *Dew* was considerably below the usual mean amount compared with a series of years.

There were 56 days perfectly cloudless, which is 25 more than the cloudless days of 1857. There were 118 nights suitable for astronomical purposes.

The Aurora Borealis was visible at observation hours on 39 nights. *Lunar Haloes* were seen on 4 nights. The *Zodiacal Light* was very bright in February, but since then has exhibited no special appearance. *Parhelia* were visible on 2 days.

The Eclipse of the Moon was *visible* on the 27th February. The Eclipse of the Sun was *invisible* on the 15th March owing to cloudy weather.

The winter of 1857–58 fairly set in on the 22nd December, 1857.

Ozone.—The amount of ozone during the year has shown an increase on the usual average. Observations are now being taken here, intended to show the effects of the different clouded rays of light on the Ozoneometer, and also the effects of vegetation on the amount.

Atmospheric Electricity.—The tri-daily observations are still continued in this important branch of science, the amount indicated in frequency and tension is very near equal to the amount of last year, but is nevertheless rather below the usual average. The *Romershausen* apparatus seems pretty well adapted for the purpose of collecting atmospheric electricity, but is inferior to the large apparatues which is erected here, both as to collecting and retaining the electric charge.

The Song Sparrow (*Fringilla Meloda*) the harbinger of spring, first heard on the 10th March. Swallows (*Hirundo Rufa*) first seen the 15th April. Frogs (*Rana*) first heard the 15th April (this is about a week earlier than usual,) Shad (*Alosa*) first caught 29th May. Fire-flies (*Lampyris Corusca*) first seen the 18th of June. Snow Birds (*Electrophanes Nivalis*) first seen 26th October. Crows did not winter here this year. Wild Strawberries in flower 27th May, and matured 26th June. Gooseberry in leaf 9th May. Currant tree in leaf 21st May. Plum tree in blossom 26th May. Apple tree in leaf 3rd June.

The potatoe rot, which manifested itself but partially this year, commenced in this neighborhood on the night of the 7th August.

St. Martin, Isle Jesus, 21st March, 1859.

GRUS AMERICANA AND GRUS CANADENSIS: ARE THEY THE SAME BIRD IN DIFFERENT STAGES OF GROWTH?

BY T. J. COTTLE, F.R.C.S.E.

Read before the Canadian Institute, 12th February, 1859.

The great variation of plumage that many species of birds, especially of the order Rapaces, undergo before arriving at their adult dress, and the consequent multiplication of species, is well known to Ornithologists: And it falls rather to the task of the out-door naturalist than to the systematist in his closet, to unravel such difficulties.

In this notice it will be my endeavour to show that the Whooding Crane (*Grus Americana*) and the Sand-hill Crane (*G. Canadensis*) are not identical birds. This assertion from an obscure naturalist, in contradiction of America's two greatest ornithologists, Wilson and Audubon, may well be considered presumptuous. In this brief notice, however, I confine myself to the setting forth of facts which have come under my own personal observation, with the hope of eliciting further information from other observers.

Audubon, in his Synopsis, the only work of his I have at hand to consult, under his species *Grus Americana,* gives *G. Canadensis* as a synonym without comment. Wilson speaks more guardedly, and does not seem decided, he says:

"It is highly probable that the species described by naturalists as the *G. Canadensis,* is nothing more than the young of the Whooping Crane, their descriptions exactly corresponding with the latter. In a flock of six or eight, three or four are usually of that tawny or reddish brown tint on the back, scapulars, and wing coverts, but are evidently yearlings of the Whooping Crane, and differ in nothing but in that and size from the others. They are generally five or six inches shorter and the primaries are of a brownish cast." He then goes on to say: "The Whooping Crane is four feet six inches in length, from the point of the bill to the end of the tail."

My first reason for suspecting this idea to be incorrect, was, that during a visit I paid to the Prairies of Illinois some three years back, I saw several large flocks of these birds, containing in the aggregate some hundreds, and not one white or even mottled bird among them. I was informed by a farmer, that shortly before my arrival, there had been some beautiful white swans feeding on his corn in company with the Sand-hill Cranes. As this was an unusual habit for swans, I have no doubt they were the Whooping Crane in adult white plumage; but none were to be seen after my arrival. As this was quite at the end of October, is it not probable that the Whooping Crane had passed on in his annual southern journey, while the Sand-hill, a distinct though closely allied species, was later in its migrations? It is not likely that young birds would be more capable of braving cold than the old, or that they should be so much more numerous as to be present in hundreds without a single adult individual among them.

This may be said to be only conjecture, but what has confirmed my

previously conceived idea, is, that three or four individuals of the Sand-hill Crane, have been in the possession of Mr. Barnett, of the Museum, Niagara Falls, he tells me, for five years: and he can see no change of plumage in them during the whole of that time. Now I know of no bird that attains so great an age without assuming its adult plumage, or, at any rate, making an approach to it. The Bald Eagle takes longer than any American bird I know, and he is in full plumage in the fourth year, and begins to show the white on head and tail in the second or third year. And as Mr. Barnett says that his Cranes have not made any change in their plumage since he had them, they must have lost the characteristic brown plumage of the young before he saw them and must be more than five years old. In the summer of 1856 I visited the Falls, and saw a pair of young birds that had been hatched that season; they were entirely brown. The parent birds were much attached to them and fiercely attacked an intruder, their sharp and powerful bills making them dangerous antagonists. I regret that when sending to Mr. Barnett for information regarding the old birds, I forgot to enquire if the young birds I had seen had lived, and, if so, when they had changed their plumage.

I think the proofs are sufficient to claim specific distinction for the Sand-hill Crane. It is very probable that the young of the Whooping Crane may very much resemble that of the Sand-hill, and that they might easily be mistaken the one for the other.

The specimen I procured in Illinois has one or two brown feathers on the scapulars. The primaries are dusky black; and the length is nearly four feet, being as near as possible, as Wilson observes, six inches less than his measurement of the Whooping Crane. So unvarying a measurement I think must be a specific difference.

REVIEWS.

Geological Survey of Canada. Report of Progress for the year 1857. Printed by order of the Legislative Assembly: Toronto, 1859.

The Geological Survey continues amply to sustain the reputation of its earlier contributions to our growing science. In the Report of Progress now before us, there are many valuable additions to the already large accumulation of facts belonging to the geology

and geography of the Province; and a more varied character is imparted to it, by the introduction of numerous details connected with our Natural History, properly so-called. It is to be regretted that the means at the disposal of the Geological Commission will scarcely allow of a more extended elaboration of this latter feature: otherwise, we might hope to see, in future Reports, an exposition of the Botany and general Fauna of the various districts visited by the Survey. Our knowledge of the natural history of the remoter regions of both Upper and Lower Canada, is at present of the most meagre character; and it is obviously impossible to do much towards the amendment of this by any effort of private enterprise. Whilst urging the consideration of this question, therefore, upon the attention of the Legislature, we welcome the commencement of the good work, slight though it be, laid before us by the Director of the Survey in the Report now under review.

In addition to a general statement of working details by Sir William Logan, this Report contains no less than five distinct communications by the Officers of the Survey, together with a Report on Canadian Graptolites by Professor Hall of Albany, and one on the respective longitudes of some of the principal places in Canada by Lieut. Ashe, R. N. The details of Sir William's more special explorations in connexion with the Laurentian limestones of Grenville, &c., are to appear in the Report for 1858.

The Report of Mr. Murray comprises an elaborate survey of the mouths of the French River, with the adjacent coasts and islands; a description and survey of Echo Lake and the surrounding country; and an examination of the Huronian limestone of the Bruce Mines' district. Apart from the purely geological information afforded by Mr. Murray's researches, the thanks of our geographers are again due to him for his carefully conducted topographical measurements along the northern coast-line of Georgian Bay—a district of much intricacy. For the accurate delineation, indeed, of the geographical features of this part of Canada, we are chiefly indebted to Mr. Murray's skill as an instrumental surveyor. Passing to the geological portion of the Report, we find that Laurentian rocks, of no special interest, prevail exclusively on the coast and islands in the neighbourhood of French River; whilst around Echo Lake the rocks are chiefly of Huronian age. A slight outcrop of over-lying unconformable strata, suggested as Lower Silurian, skirts the shores of Great

and Little Lakes George, St. Mary River, and a portion of Sugar Island. The physical structure of the district was principally worked out by means of a broad limestone band, associated with the other Huronian rocks. The formation generally, as in other places, was found to be traversed by masses of trap, greenstone, and porphyrytic granite. Copper pyrites appeared to be disseminated very generally through the greenstone, and in quartz veins, especially south of Echo Lake and north of the mouth of Root River; both of which localities, Mr. Murray informs us, have been taken up for mining purposes, but without advantageous results. Specular Iron Ore was also observed, both in the trap and in the sedimentary portion of the series. Around Echo Lake, the rocks presented examples of polished surfaces with ice-grooves and scratches, the direction of the latter varying from S. 55° W. to S. 70° W.

The Report of the Assistant Provincial Geologist is followed by one from the pen of Mr. Richardson, Explorer to the Survey. Mr. Richardson's labors comprise a detailed examination of the Magdalen River, in Gaspé, and a portion of the country to the east as far as Gaspé Bay; with an exploration of the Saguenay and Lake St. John. His Report, like that of Mr. Murray, is accompanied by several plans and sections*, and abounds in matter of much geological interest, more especially when considered in connexion with the previous explorations of Sir William Logan and Mr. Murray in the Gaspé peninsula. In its physical structure, Eastern Gaspé appears to offer a series of synclinals and anticlinals running more or less parallel to the northern coast, and comprising, passing from north to south, a range of beds from the upper portion of the Lower Silurian strata to the lower portion of the Carboniferous formation. In Mr. Richardson's map, one of these synclinals is shewn to constitute a probable continuation of Gaspé Bay, and to extend westerly in a broad trough far into the county. The edges of the trough consist of "Gaspé limestone," with "Gaspé sandstone" in the central portion. Amongst the economic substances met with by Mr. Richardson in that portion of Gaspé to which his explorations were confined, the following are cited:—Brick-clay from the mouth of the Magdalen, Serpentine (apparently, however, of poor quality), and common and hydraulic limestones—the latter, magnesian.

* The topographical work of Mr. Richardson's exploration was performed by Mr. Scott Barlow, whose efficient services are fully credited in the Report.

In the second part of his Report, Mr. Richardson speaks highly of the climate and agricultural capabilities of the Valley of Lake St. John. He remarks — "the cultivable land of the Valley of St. John most probably occupies a very large proportion of its area [estimated at about 5000 square miles], and, as in the settled part of it good crops seem to be the general result, it appears to me very probable that the valley will hereafter support a very considerable population. There appears to be no doubt in the minds of the settlers that they are able to grow all the kinds of grain produced in the neighbourhood of Montreal, and in equal abundance; and the unexplained superiority of climate in the valley over places more to the south, renders the investigation of this part of the Province a subject of considerable interest." The greater part of the valley is occupied by Laurentian rocks, including many beds of lime feldspar, and capped in places by thick deposits of Drift or Post-Tertiary clays and sands. Lower Silurian strata occur however in the islands and on the shores of the lake. These strata, as clearly indicated by their fossils, belong to the Trenton group and to the Utica slate; but traces of the Hudson River group, and probably also of the Middle Silurian series (?) appear to have been met with on one of the islands: indicating perhaps a geological connexion between this district and Anticosti. In reference to this view, the occurrence, at least, on this island, of the curious *Beatricea undulata* (so abundant in Anticosti) is a fact of no little interest. Another important palæontological discovery made by Mr. Richardson on Lake St. John, is the association of *Halysites catenulatus*, the well-known "chain coral," with Trenton fossils. Until recently, this species was looked upon as exclusively confined in America to the horizon of our Niagara and Clinton group. Mr. Richardson found it in Anticosti* associated with Hudson River types, and he now recognises it in a still lower position.

In addition to Mr. Barlow, the Surveyor, Mr. Richardson was accompanied in his exploration by Mr. Robert Bell; and the latter gentleman has drawn up a Report of considerable merit on the mollusca and natural history generally of the districts visited by the exploring party. As a knowledge of our living mollusca is of the greatest importance for the proper investigation of our Post-Tertiary deposits, we have collected in the following classified list the different

* See our Review of the Report of Progress for 1856: *Canadian Journal*, vol. III, p. 327.

species met with by Mr. Bell in the course of his expedition.* Although necessarily an incomplete enumeration of our terrestrial, fresh-water, estuary, and marine species, taken together, it may help to direct attention to the subject, and serve as a groundwork for future additions.

CANADIAN MOLLUSCA, INCLUDING A FEW SPECIES FROM LABRADOR:

CEPHALOPODA.—[Mr. Bell does not enumerate any examples of this class; but Prof. Dawson (Canadian Naturalist, vol. iii, p. 329) has obtained *Loligo illecebrosa* from the coast of Gaspé; and examples of the following genera may probably be looked for, in addition;—*Octopus, Cirroteuthis, Onychoteuthis,* and *Ommastrephes.* A species of the latter genus certainly occurs in the Gulf of the St. Lawrence. It is the "flying squid" or "sea-arrow" so abundantly used as bait by the Newfoundland fishermen.]

GASTEROPODA.

HELICIDÆ:—*Helix hortensis* (imported); *H. alternata; H. labyrinthica* (Say); *H. egena* (Say); *H. lucida* (Drap.); *H. striatella* (Ant.); *H. pulchella; H. harpa;* [*H. albolabris* (Say); *H. monodon*† (Racket).] *Succinea obliqua* (Say); *S. vermeta* (Say). *Vitrina pellucida* (Drap). [The latter species was found by Mr. Bell, near the mouth of the Magdalen River. Unless introduced, its occurrence is of some interest, as the genus *Vitrina* belongs almost exclusively to the Old World. It forms a connecting link between the *Helicidæ* and the *Limacidæ*].

LIMNÆIDÆ:—*Limnæa catascopium* (Say); *L. umbrosa* (Say); *L. apacina* (Lea); *L. modicella,* and two new species. [The well known *L. stagnalis, L. gracilis,* and several other species, likewise occur in Canada]. *Physa aurea* (Lea); *P. heterostropha* (Say); *P. ancillaria* (Say); *P. elliptica* (Lea). [*Ancylus rivularis* (Say).] *Planorbis trivolvis* (Say); *Pl. parvus* (Say); [*Pl. deflectus; Pl. companulatus;*

---

* The shells collected by Mr. Bell were subsequently examined, and their specific determinations confirmed, by the distinguished conchologist Prof. Lea of Philadelphia. A few of the species mentioned in our list were obtained by Mr. Bell in a previous expedition to the mouth of the St. Lawrence; and some are added from personal observation and other sources, especially Professor Dawson's paper "A Week in Gaspé," published in the third volume of the *Canadian Naturalist.*

† We have found the shell of this species, in great profusion, imbedded in the "flats" of the Grand River, in Western Canada. A compressed "parietal" tooth extends into its somewhat contracted aperture.

Pl. bicarinatus. The two latter found by Mr. Billings, at Lake Clear.]

STROMBIDÆ:—[*Rostellaria occidentalis*, Mr. Carpenter, Labrador coast].

MURICIDÆ:—*Fusus borealis* (DeKay); [*F. paramidilis*, obtained by Prof. Dawson from stomachs of cod; *F. (Trophon) scalariforme*, Mr. Carpenter, Labrador coast].

BUCCINIDÆ:—*Buccinum undatum*; [*B. trivitatum*, Prof. Dawson]. *Purpura lapillus.*

NATICIDÆ:—*Natica heros*; *N. triseriata* (?); [*N. Grœnlandica*, *N. clausa*, Prof. Dawson, from stomachs of cod].

TURRITELLIDÆ:—*Scalaria Grœnlandica* (Gould). [*Turritella erosa*, Prof. Dawson, from stomachs of cod].

LITTORINIDÆ:—*Littorina tenebrosa*; *L. palliata*; *L. rudis*. [*Lacuna vincta*, Prof. Dawson].

TURBINIDÆ:—[*Margarita* (*Trochus*) *undulata*, *M. helicina*; Prof. Dawson, from stomachs of cod].

PALUDINIDÆ:—[*Paludina decisa* (Say); and two or three (?) other species]. [*Valvata tricarinata* (Say); *V. pupoidea* (?)].

PATELLIDÆ:—[*Acmœa* (*Lottia*) *testudinalis*, *Acmœa caeca*, Prof. Dawson].

CHITONIDÆ:—[*Chiton marmoreus*, Prof. Dawson].

LAMELLIBRANCHIATA.

MYACIDÆ:—*Mya arenaria*; *M. truncata*; [*M. Uddevallensis*]. [*Saxicava rugosa*, Prof. Dawson].

SOLENIDÆ:—*Solen ensis*. [*Machœra costata*, Prof. Dawson]. *Glycimeris siliqua.*

TELLINIDÆ:—*Tellina grœnlandica*; *T. calcarea*; *T. tenera*. *Sanguinolaria fusca*, *Mesodesma arctata.*

MACTRIDÆ:—*Mactra ovalis.*

CYPRINIDÆ:—[*Cardita borealis*, Prof. Dawson]. *Astarte sulcata.* [The dredge will probably reveal the presence of other species of *Astarte*, with examples of *Cyprina Islandica*, &c.]

CYCLASIDÆ:—[*Cyclas*. Seven or eight small species appear to belong to our lakes and rivers].

CARDIADÆ:—*Cardium Islandicum*; [*C. Grœnlandicum* (?)]; [*C. pinnulatum*, Prof. Dawson, from stomachs of cod].

UNIONIDÆ:—*Unio complanatus*; *U.* (*Alasmodon*) *arcuatus*; *U.*

(*Magaritana*) *margaritiferus* [with several other species (as *U.* (*M.*) *marginata*, and *U.* (*M.*) *rugosa*, found by Mr. Billings at Lake Clear), but *U. arcuatus* and *U. margaritiferus* are perhaps identical]. *Anodon fluviatilis*, found by Mr. Billings at Lake Clear.

ARCADÆ:—[*Leda* (*Yoldia*) *limatula*, Prof. Dawson]. The dredge will undoubtedly reveal the existence of other species in the St. Lawrence Gulf.

MYTILIDÆ:—*Mytilus edulis*. [*Modiola modiolus*, *M. decussata*, Prof. Dawson].

OSTREIDÆ:—*Anomia ephippium*. *Pecten Islandicus*; *P. Magellanicus*.

PALLIOBRANCHIATA OR BRACHIOPODA.

RHYNCONELLIDÆ:—[*Rhynconella psittacea*—not obtained by Mr. Bell, but known to occur in the Gulf of the St. Lawrence].

The valuable report communicated by Professor Hall, contains descriptions of various new species of Canadian graptolites, obtained within the last few years, in a condition of extraordinary preservation, in the Hudson River group of Point Levi, opposite Quebec. As this report will form the subject matter of one of the forthcoming Decades of Canadian Organic Remains, its contents will be brought before the notice of our readers in another number of the Journal. At present, therefore, we will merely observe, that Professor Hall considers the graptolites to be distinct from the Bryozoa*; and he inclines to the opinion that these organisms were perhaps pelagic forms, floating freely in the sea. The latter idea appears now to be very generally entertained; but there is a somewhat forcible objection to it, which does not seem to have occurred to the holders of this view. It is evident that the compound graptolite structure, or organism, could have possessed in itself no direct powers of locomotion. If free, it must have floated whithersoever the waves and winds directed it; and, in this manner, it must have drifted, sooner or later, upon coast lines, and there have perished. We, therefore, still hold to the earlier opinion, that the graptolite mass, in the living state, was attached by its base —and there is nothing in Sir William Logan's new forms to invalidate this,—to stones, sea-weeds, and other submarine bodies. We

* See, on this subject, a note by the writer, in vol. i, p. 388, of this Journal.

are glad to find that Professor Hall persists in the non-recognition of the so-called genera *Monograpsus*, *Diplograpsus*, *&c.* Although he stands, in so doing, almost alone amongst palæontologists, every new discovery tends to prove the justness of his views.

The Report of Mr. Billings, although necessarily of limited popular interest, will be fully appreciated by all engaged in the study of our palæontology. It comprises descriptions and figures of various new genera and species of Canadian fossils, with a brief notice of Lake Clear, in the newly surveyed township of Sebastopol, and an exceedingly interesting essay on the Fauna of the Black River and Trenton Limestones of Canada, as compared with that of similar formations in New York and Tennesee. Amongst the new forms, we have a remarkable species of *Obolus* (*O. Canadensis*, Billings), two inches or more across, from the Trenton (or Black River) limestone of the Fourth Chute of the Bonnechère, Pauquette's Rapids, and from the townships of Stafford and Westmeath, in the County of Renfrew. Also a new genus of Brachiopoda named *Eichwaldia*, by Mr. Billings, characterized more especially by a perforation for the peduncle at the *back* of the umbo of the larger valve; and a new lamellibranchiate genus named *Cyrtodonta*. The latter, which is distinguished by the possession of three more or less curved anterior or cardinal teeth, (whence the generic name,) and two or three lateral teeth (situated posteriorly), exhibits species from the Black River limestone, the Trenton limestone, and the Hudson River group, respectively. The results of Mr. Billings' comparative analysis of the fossils of the Black River and Trenton beds of Canada, New York, and Tennesee, confirm the fact, first shown by Sir William Logan in 1851, of a gradual passage of the lower into the higher formation with us, whilst in the State of New York a strong line of demarcation exists between the two. In Tennesee, on the other hand, there is a complete intermingling or rather inversion of these forms; some of the more highly characteristic Black River types of New York, (*Columnaria alveolata* and *Stromatocerium rugosum*, for example,) occupying a higher position than the typical Trenton forms.* For this reason, whilst retaining for special applications the subdivisions of Chazy, Bird's Eye, Black River, and Trenton limestones, it is advisable in a general point of view to arrange

* See Professor Stafford's paper "On the Silurian Basin of Middle Tennesee," in Silliman's Journal, 2nd series, vol. xii. p. 352,—quoted by Mr. Billings.

these deposits together under the common term of the Trenton group or series.

Mr. Sterry Hunt's contributions to the Report of Progress for 1857, comprise a continuation of his researches on the composition of our magnesian limestones and the formation of dolomites generally, together with a valuable and very interesting communication on Fish Manures. Pure dolomite consists of equal atomic proportions of carbonate of lime and carbonate of magnesia; or, in 100 parts, of CaO,CO^2 54.35, and MgO,CO^2 45.65. Very few of our magnesian limestones, however, exhibit these exact proportions; but Mr. Hunt, availing himself of a reaction pointed out by Karsten many years ago, has shewn that most of these consist of an admixture of carbonate of lime and true dolomite. Whilst the latter compound resists the action of cold acetic acid, or is but slightly attacked, carbonate of lime is readily dissolved by that re-agent, and hence, a separation of the two is easily effected; the silica and other accidental matters being afterwards removed from the dolomite by treatment with hydrochloric acid. A portion of the carbonate of magnesia, in the majority of the dolomites analysed by Mr. Hunt, is replaced by carbonate of iron, and in some, also, by carbonate of manganese. Examples of magnesian limestones containing a larger amount of magnesia than is required for the production of a dolomite, although of not uncommon occurrence in other countries, do not appear to have come under observation in Canada. With regard to Mr. Hunt's comprehensive and now apparently well-established views on the origin and formation of dolomites, we must refer our readers to the valuable paper communicated by that gentleman to the last number of the Canadian Journal (page 184), Mr. Hunt having greatly extended his experimental researches on this subject since the date of the present Report.

Mr. Hunt's remarks on the manufacture of fish-manures are of great practical importance, and merit well the attention of our agriculturists. Fish have long been used as a manure in many parts of Europe bordering on the sea, and more especially along the western coast of France, in Scotland, and on the hop grounds of the English counties of Kent, Sussex, and Hampshire. At Concarneau, in the department of Finisterre in France, an establishment for the manufacture of portable manure from the offal of sardines, caught extensively off that coast, is in active operation. The process consists in exposing the fish-offal for some hours to steam heat, pressing it afterwards to

extract the oil and water, and then drying the pressed mass thoroughly, and grinding it to powder. One hundred parts of offal are said to yield about twenty-two parts of powder, of which from four to five tons are daily produced in the manufactory at Concarneau. The powder, according to Mr. Hunt, averaged, in 1854, about $37 the ton, and is now probably of greater value. M. Démolon, the proprietor of the Concarneau works, has likewise established a manufactory of a similar kind at Kerpon on the coast of Newfoundland, which produces from cod refuse an annual yield of 8,000 or 10,000 tons of portable manure. Of late years also, Mr. Duncan Bruce of Gaspé has endeavoured to introduce the manufacture of fish-manure into Canada. He mixes the dried fish-remains with the products of distillation of a bituminous shale, and with the calcined residue of this shale, but the utility of this mixture seems to be, at least, questionable. In summing up his observations, Mr. Hunt remarks, "the results which we have thus given clearly shew that by the application of a process similar to that now applied in France and in Newfoundland, which consists in cooking the fish, pressing it to extract oil and water, drying by artificial heat, and grinding it to powder, it is easy to prepare a concentrated portable manure, whose value, as a source of phosphoric acid and ammonia, will be in round numbers about $40 the ton. We can scarcely doubt that by the application of this process a new source of profit may be found in the fisheries of the Gulf, which will not only render us independent of foreign guano, now brought into the Province to some extent, but will enable us to export large quantities of a most valuable concentrated manure, at prices which will be found remunerative." There seems to be no reason why our fisheries of the West should not also be able to maintain, to a certain extent, manufactories of this manure.

The Report of Lieut. Ashe, R. N., contains the results of a series of operations undertaken by him at the request of Sir William Logan, for the determination of the correct longitude of Quebec by reference to that of Cambridge Observatory in the United States; and the longitude of Montreal, Ottawa, Kingston, Toronto, Collingwood, Windsor, and Chicago, respectively, by reference to that of Quebec,—the determinations being effected essentially by the direct transmission of signals along the wires of the electric telegraph. Between Chicago and Quebec, the signals were transmitted without intermediate repetition, "*via* Toledo, Cleveland, Buffalo, Toronto, and Montreal, a distance of

1210 miles, and were distinctly heard at either end of the line." The time occupied by the transmission of a signal throughout that distance was only 0.8 of a second. The signals were based upon the passage of stars across the field of a transit instrument fixed in the meridian upon as solid a support as could possibly be obtained; and Lieut. Ashe was put to no little trouble in effecting this latter and most essential point. The longitudes thus carefully ascertained, were found to differ considerably from those previously admitted. The following are those obtained by Lieut. Ashe, in hours, minutes, and seconds, west of Greenwich:—Quebec, 4h. 44m. 49.02s. Montreal, 4h. 54m. 11.72s. Ottawa, 5h. 2m. 48.29s. Kingston, 5h. 5m. 54.22s. Toronto (Magnetic Observatory), 5h. 17m. 33.43s. Collingwood, 5h. 20m. 50.53s. Windsor, 5h. 32m. 8.02s. Chicago, 5h. 50m. 30.54s.

These determinations were made with a view to impart additional accuracy to the large Map of Canada, on which the Geology of the Province is now being laid down under the direction of Sir William Logan. Valuable, therefore, as this map will undoubtedly be to geologists, and to all interested in the correct delineation of the physical structure of the country, its publication will also be of no common value in a purely topographical point of view.

E. J. C.

The Master-builder's Plan or the principles of organic architecture as indicated in the typical forms of animals. By George Ogilvie, M.D., Lecturer on the Institutes of Medicine, &c., in Marischal College, Aberdeen. London: Longmans. 1858, 8vo.

Dr. Ogilvie has selected a subject upon which a good popular work was undoubtedly wanted, to communicate not merely to the special student of natural science, but to the intelligent and cultivated portion of society generally, the splendid discoveries now recognized among competent judges, of Owen and those who have laboured in different departments in the same spirit: discoveries which have done for Zoology, what Goethe, DeCandolle and others, did for Botany, elevating its character as a philosophical study, and assisting the inquirer to appreciate not only the beautiful adaptations of particular organisms to the circumstances and wants of the creature, but also

the common plan which runs through extensive groups and the manner in which comparatively slight variations are made to fit each for its destined condition. The subject is interesting and important, the author's style clear, correct, and pleasing, and the numerous illustrations afford great assistance to the reader, so that although the work pretends to no novelty, it promises much utility, and deserves to be recommended to all who desire to comprehend the great principles and general results of Zoological Science.

In giving an outline of Zoological classification, it would in our opinion have been an improvement, if our author had made Protozoa a fifth sub-kingdom containing the classes Porifera, Rhizopoda, and Infusoria; and notwithstanding the close relationship of Polypifera and Acalephae forming Mr. Huxley's COELENTERATA, it might be as well at present to keep them separate as classes with Echinodermata of the Radiate sub-kingdom. Among Vertebrata there ought to be no hesitation in distinguishing five classes, Fishes, Amphibia, Reptilia, Birds, and Mammalia. There is without doubt a considerable external resemblance between Amphibia and some Reptilia, but the Anallantoidian embryo; the naked surface; the two modes of respiration in most species, at least in some stages of their existence, most of them passing through metamorphosis; the absence of ribs, and some other anatomical particulars, form perhaps as good characters for a class as those which distinguish other received classes and justify the eminent naturalists who assign a fifth class to Vertebrata.

We may possibly be somewhat influenced in this decision by a fancy that we have found natural and good divisions in all parts of the animal kingdom, falling into the numbers three or five. It seems to us that there is something in this of a general law. Under each type we have a group expressing its lowest degree of development, one expressing the predominance of the functions of vegetative life, and one in which the functions of animal life take the lead. Each of the two latter however, naturally sub-divides, at least in all the higher divisions into two, expressive of different variations in the destined mode of life. In the last mentioned divison, one for example, will display more of power or fierceness, another more of vivacity and activity. In the greater natural divisions we sometimes think we observe a nucleus or central group, peculiarly typical, around which the five leading modifications dispose themselves. Beyond this, we know of no deviations from the above mentioned numbers which we

are not either prepared to condemn as erroneous, on what seem to us abundantly sufficient reasons, independent of any numerical theory, or regard as cases of imperfect knowledge and, as yet, unsettled arrangement. If we could here take space for the illustration of our ideas, we should choose for the purpose the great class of birds; should designate the Insessores as a great central group, peculiarly typical, and range around them Raptores, Scansores, Rasores, Grallatores and Natatores, whilst the Insessores themselves, placing the families of Sylviadae and Fringillidae in the centre, as the most typical birds, would, by the sections Dentirostres, Syndactyli, Conirostres, Tenuirostres, and Fissirostres, represent the five greater deviations from the type in the order in which we have given them. In the same way the families under each order and section are found to be analogous to the greater divisions. What we have proposed may seem but the echo of a system which has passed away, and may be condemned as an attempt to fetter nature with our theories. We can but say that with us it results from practical labour in an extended field, and that all the theory which pertains to it is an attempt to explain and connect together a series of judgments in particular cases, with, as a general result, a disposition to expect that other cases of a similar kind will conform to those already examined. The means of classifying well are improving from day to day, with the increase of anatomical and embryological knowledge, but classification has not yet improved in proportion. Opinions fluctuate, and there is a feeling of the need of at least very great improvements. It is a time when authority and prescription lose their hold on us, and men look around in search of something better, often, no doubt, falling on a wrong track, yet even then, perhaps, doing something to prepare the way for more ingenious, or more judicious successors. We touch on the subject of classification only incidentally here, and must not dwell upon it, but since, so far as it is good, it expresses and conveys knowledge, and all its faults, mislead and embarrass students, it is worthy of all the attention we can bestow upon it.

The analogies now observed between Vertebrata and Articulata, are, we conceive, to be accounted for from the consideration that these two sub-kingdoms exemplify the preponderance of the functions of animal life, the former being the especial manifestation of power, the latter of activity, whilst the Mollusca and Radiata manifest the predominance of the vegetative functions and accordingly are formed on entirely differ-

ent models and the Protozoa represent the lowest degree of development consistent with animal life. The following introductory account of the points of agreement and difference between Vertebrata and Articulata is deserving of attention: "In the following remarks attention will be directed mainly, and in the first place to the Articulate and Vertebrate groups, which appear to form a natural series distinguished by some remarkable peculiarities, wanting in the other two [Mollusca and Radiata], especially by the presence of a jointed frame-work or skeleton, for the support of the soft parts of the body. This is a character indicated by their names, Vertebrata and Articulata, meaning respectively, *hinged* and *jointed* animals, and suggesting the same general idea of a series of parts, so connected as to turn on each other, in the manner of a hinge or joint. All these animals, in fact, have in so far the same general conformation, that their skeleton consists of a series of pieces, placed one in front of the other, so as to form an elongated shaft, which, notwithstanding the rigid nature of the several parts, has a certain flexibility, owing to the numerous joints connecting these together. At the anterior end of this column is the head, in which, along with the principal organs of sense, is situated the mouth or anterior opening of the alimentary canal, closed by movable jaws. The animal is also furnished with locomotive organs or limbs, all having a downward direction, and jointed like the shaft of the skeleton, to which they are connected in pairs. The arrangement of these parts, and indeed the whole organisation of the animal, is highly symmetrical in its earliest condition, although in many cases, as the embryo assumes the characters of the adult, this is interfered with by the disproportionate development of certain organs of the body.

"But Vertebrate and Articulate animals agree farther in some respects which do not seem to have any necessary dependence on this segmentation implied in their respective names. In both groups the central tract of the nervous system forms a cord along the axis of the animal, with its anterior extremity developed into an organ having a certain analogy to the human brain. In both the central organs for the circulation of the blood are a contractile vessel or heart, propelling the blood towards the head, and an arterial trunk returning the main current in the opposite direction. In both the digestive system is represented by a canal running in the length of the interior of the body, and opening before and behind by appropriate orifices on the lower as-

pect of the animal. On the other hand, although these several systems agree in many of their relations in the two groups, in some points they are as strikingly contrasted. Thus the skeleton, which is mostly confined in Vertebrata to the interior of the body, is wholly external in Articulated animals, so that the jointed character is at once apparent in them, while in the former it is so obscured by the investing layer of soft parts, as almost to escape notice, till exposed by dissection. Again, the position in the body of the vascular, nervous, and alimentary systems, is completely reversed in the two groups, notwithstanding the close correspondence of many of their details."

In his second, third, and fourth chapters Dr. Ogilvie has given a very excellent outline of the modifications of the Vertebrate and Articulate types in the several classes of the two great sub-kingdoms. As may be inferred from what we have already said, we think he might with advantage have dwelt on the peculiarities of the Amphibian group, and so, in treating of Articulata, our views of their classification would lead to some changes of plan, thus we can see no more reason for separating the lower Articulata from the higher under a distinct name (they are called *Annuloida* by Milne-Edwards,) than for detaching the mites from Arachnida, the Ichthyopthira from Crustacea or any other section of low development from the class which it resembles in the essentials of structure. Annelida with its appended sub-class Entozoa differs from the higher Articulata by just such a change in its external skeleton as is observed in the internal in a few of the lowest Vertebrata. The Rotifera, not mentioned by our author, doubtless from his adopting some different idea of their position, seem to us to constitute the lowest Articulate class; next to them we place Annelida, of which we must regard Entozoa as a mere section containing the less developed forms. The great class Crustacea, so varied and extensive in its series of forms, is the highest in which the functions of vegetative life predominate, whilst Insecta, of which Myriapoda seems to be but an inferior section, and Arachnida complete the sub-kingdom, and specially display the activity and fierceness which are usually found in those higher classes where the nervous and motory functions are in most vigour. The leading points of contrast between Vertebrata and Articulata are thus summed up by our author. pp. 86, 87.

"1. In the skeleton being:—
In Vertebrata mainly internal;
In Articulata wholly external.

"2. In the Ventral or lower surface (on which are situated the limbs and the two orifices of the Alimentary canal) coinciding in Vertebrata with the haemal aspect.
In Articulata, with the neural aspect.
"3. In the anterior end of the Alimentary canal, reaching this surface by traversing:—
In Vertebrata a vascular loop;
In Articulata [both a vascular and*] a nervous loop.
"4. In the posterior end of the Alimentary canal, reaching the same surface:—
In Vertebrata, short of the neuro-vascular spine, which is prolonged as a tail;
In Articulata, beyond the termination of the nervous cord, and at the extremity of the body, so that there is no true tail."

In what he says of the Mollusca, Dr. Ogilvie follows the views of Huxley, a very learned and ingenious man, an original observer, and a bold speculator, who has, we have no doubt, thrown much valuable light on the Molluscan structure; but the summary given by our author leaves the difficulties respecting the classes in this sub-kingdom untouched, not even naming several important groups, whose leading characteristics would be interesting to the most general student. We must refer to the volume itself for the summary of Mr. Huxley's doctrines. Our author remarks upon them that, "though there may attach a certain ambiguity—as he admits himself—to some of his conclusions, he seems to have abundantly established the general principle that the modifications of the common plan,—which, in Vertebrata and Articulata, are dependent on the over-development or abortion of some of the parts entering into the composition of the several segments, or by the addition or subtraction of entire segments of the skeleton, are to be ascribed in Mollusca to local expansions of certain parts of the soft body of the animal. By such out-growths of particular regions we are to explain not only the very general loss of symmetry, and the neural and haemal flexures characterising the several classes, but also the origin of such appendages as the arms and funnel of the cuttle-fish, and the gill tufts and tentacles of other Mollusca. Even the so-called external skeleton or shell—which is certainly the most permanent, as it is to general observers the most characteristic feature of the group—is merely the calcareous cast of such an expansion, being moulded on the fold termed *the mantle*,

* The bracketed words apply only to a portion of Articulata.

whose characters it faithfully preserves, even to the papillary prolongations of its margin, which are a distinguishing mark of some species."

We think it will probably be decided that the method in most general use of characterising the classes of mollusca in a great degree by their organs of motion is unsatisfactory, and that the groups known as Pteropoda, Heteropoda, and Gasteropoda ought to be combined, the first mentioned being but a less developed state, resembling the fry of many Gasteropoda, and the second small group a mere modification of the same general structure. Thus the Cephalous Mollusca, exhibiting the greatest power and activity of which the type admits, would form two classes, the Cephalopoda standing highest. The *Bryozoa* display the lowest degree of development in the whole sub-kingdom; *Tunicata* will stand next; and *Conchifera*, uniting the Lamellibranchiate and Palliobranchiate groups, which are but sub-classes, will complete the series, giving us representatives in this sub-kingdom of all the great divisions of the animal kingdom, in classes which, both as to the essential agreement of their members and the soundness of the distinctions employed, are as good as we can find in any part of the system.

As we descend in the scale of being we find the number of the greater divisions diminished, and the characters less easily appreciable. In our opinion the sub-kingdom Radiata is sufficiently bound together by its characteristic arrangement of its nervous system and its striking external character; and we are equally satisfied that its three classes *Echinodermata*, *Acalephae*, and *Polypifera*, ought to be distinguished. Cuvier combined the two former under the name of *Radiaria*, whilst filling up the sub-kingdom with lower developments of other types, in which either no perceptible nervous system, or a very rudimentary one, could be found. Mr. Huxley, in a more advanced stage of knowledge on the subject, rightly perceives the Acalephae to be rather connected in all important points of structure with Polypifera; but, acknowledging the justness of his views thus far, we are not prepared to run these two classes into one, or to separate them altogether from Echinodermata, which latter, notwithstanding certain analogies which mark their higher position, must, in our opinion, be excluded from Articulata. The attempt to do away with the distinctness of the Radiate type does, at present, we must confess, look to us like straining after novelty at the expense of nature and

truth. With regard to the Protozoa, Dr. Ogilvie offers little information, and what he does give relates almost exclusively to Rhizopoda. In considering this lowest sub-kingdom, we have, on the one hand, to guard against mistaking for distinct forms embryonic conditions of other minute animals, and on the other to decide whether certain tribes belong to the animal or vegetable kingdom. Mistakes have been made by eminent naturalists in both these directions, but we arrive at the conclusion that after setting aside those tribes which are truly vegetable, and making every allowance for larval forms, there remain three classes of Protozoa, *Infusoria* having something of a fixed shape, an oral orifice, and some approach to a special external covering. *Rhizopoda* destitute of these characters, deriving nutriment by involving the prey in the sarcode, and getting rid of hard or useless portions by openings in this primitive gelatinous substance which can at the will of the animal be varied in form, or extended into arms or feet. The Rhizopods are either naked or enclosed in a horny, silicious, or calcareous case which may be simple or composite from the production of germs having a definite arrangement. *Porifera* resemble Rhizopoda in their substance, but are distinguished by growing in masses formed about channels through which the water which yields the required nutriment, probably decaying animal and vegetable matter, is made to pass by a ciliary movement, and which are kept open by means of hard parts, horny, silicious, or calcareous, in the form of spicula or of a net-work of fibres. In the present state of knowledge these characters seem to us clear and sufficient as distinctions of classes, and well fitted to assist inquirers in gaining a general view of the system of nature. Dr. Ogilvie's 8th chapter, entitled, "the law of typical form and manifestation of design, co-extensive with organic nature," is an excellent statement, in a concise yet intelligible manner, of a most important principle. We quote a short parapraph from his concluding remarks: "It is unnecessary farther to multiply instances in illustration of the law of typical form, as those now adduced appear sufficient to show there is some principle involved in the construction of animals beyond the mere adaptation of their organization to their appropriate spheres of life. Yet we shall certainly never disparage the indications of the latter, if we pursue the study of nature with unprejudiced minds; for even in the common type, and still more obviously in its modifications, characteristic of classes and minor

divisions, down to species, we may trace clear evidence of the adaptation of the structure to the exigencies of the case. It may be added that one very important modification of the typical conformation which recurs so regularly in the different classes, as to become itself part of the general plan, seems to be essentially an adaptation of it to a special end. It is matter of observation that in all the classes, as we ascend to the higher species, certain regions lose their uniformly jointed character, by the expansion and partial fusion of the segments. We see this very remarkably in the cephalo-thorax of crabs and spiders, and in the skull of Vertebrata, for in these cases the modification is so extreme, as completely to disguise their typical formation, which is only traceable by the clue furnished by the corresponding regions in the less highly developed species. This peculiarity has a very obvious relation to the concentration of the nervous and vascular systems, in adaptation to more centralized vitality of the higher species generally."

Our author concludes his work with a chapter on the bearing of the subject on natural theology, where we have only to regret the very limited space he has allowed himself. His work is on the whole well fitted for usefulness, and we would hope also for popularity. It will assist in diffusing the knowledge of some grand discoveries, and ingenious speculations, and being a pleasing and elegant volume, well illustrated and of no formidable size, may be recommended to those who desire general information as well as to all lovers of natural science.

W. H.

Taylor's Treatise on Poisons. 2nd Edition. Blanchard & Lea. 1859.

The appearance of a second edition of Dr. Alfred Taylor's valuable work " On Poisons," has long been desired by all engaged in that most delicate and responsible part of the Chemist's avocations, viz. the detection of poisons. The original work was one which occupied a high if not the highest place among treatises on this subject, not only from the completeness of the work itself, but also from the acknowledged talent of the author, who may be said to be the first toxicologist of England, and who has probably had more experience in cases of poisoning than any other person living.

The detection of poisons by chemical means having of late years attracted the attention of some of the most distinguished chemists, it was natural to expect that in the new edition (carefully and accurately reprinted by Messrs. Lea and Blanchard,) every attention would be paid to such improvements as had been made and had stood the test of experience, and that such new processes as had been recommended by competent authorities would be here reproduced, and if open to objection would be discussed in a spirit of impartial enquiry; in short, that the work in scientific accuracy would keep pace with the time. Such, however, does not appear to be the case as regards the only portion of the work which we have as yet had time to examine, and in the following pages we intend to draw attention to a few matters connected with the detection of arsenic, and more especially to the very off-hand manner in which Dr. Taylor dismisses the method of extracting that substance from organic tissues, which originally proposed by Duflos, has received the sanction of such men as Fresenius, Otto, and Wöhler, which is undoubtedly the best at present known both as regards ease and accuracy, and which we have not the slightest doubt Dr. Taylor himself would adopt, could he be induced to submit it to the test of experiment.

The following quotations from Dr. Taylor's work, page 365 *et seq.*, will serve as a basis for some remarks on the subject of the extraction of arsenic from organic tissues:—"MM. Danger and Flandin recommended the complete carbonization of the organic matter by heating it in a quantity of strong sulphuric acid (proved to be free from arsenic) equal to about one-third of the weight. It thus forms a tarry looking mixture, which should be brought to dryness. The vapours evolved during this operation are of the most offensive and persistent description."

"If sulphuric acid can be obtained pure, there is no doubt that this is the best mode of carbonizing organic matter. The carbonaceous mass should not be too strongly heated, or, as pointed out by Blondlot, there will be a loss of arsenic. It will be found better for the conversion of the arsenious into arsenic acid, to use strong nitric instead of nitro-muriatic acid, (as recommended by Orfila,) as this will avoid the volatilization of arsenic as chloride. After heating the mixture to expel all nitric acid, the ash may be drenched with water until all that is soluble is removed. This may be brought to dryness in a porcelain vessel, and again treated with nitric acid several times.

The acid residue dissolved in water should be neutralized by pure carbonate of potash, and again brought to dryness, the arseniate of potash thus produced (if arsenic were present) may be separated from the other salts by a small quantity of water. This solution may be introduced into Marsh's apparatus. When Marsh's process is employed I have found this to be the best plan of proceeding for destroying organic matter and avoiding a loss of arsenic."

"In the event of Reinsch's process being selected at this stage, it will be necessary to reconvert the arsenic into arsenious acid. This is effected by evaporating to dryness with a strong solution of sulphurous acid."

"Fresenius and Babo destroy the organic matter by hydrochloric acid and chlorate of potassa, and advise a series of proceedings of a most minute and elaborate kind. In fact this mode of detecting arsenic may be designated an exhaustive process. It provides for the exclusion of lead, bismuth, mercury, copper, tin, antimony, and other metals; but in thus excluding many bodies which are never likely to be found, it encumbers the investigation with the employment of so many chemicals that a question might fairly arise whether arsenic had not been actually introduced into the organic matter during the operation. I have known only one case in which it has been medico-legally employed in this country, that of Reg. v. Wooler, and there fortunately the proof of death from arsenic was so clearly made out from other facts, that it was unnecessary to make this elaborate mode of testing a subject of cross-examination. The reader who is curious about this process, the complication of which, according to Orfila, surpasses all credibility, will find the details in, &c. &c."

Dr. Taylor then goes on to say, that he has found Reinsch's process, without previous carbonization, well adapted for the separation of absorbed arsenic. The substance is digested with dilute muriatic acid (proved to be free from arsenic), &c. &c.

The reasons for Dr. Taylor's preference seem to be that the first process is more simple, requires fewer chemicals, and thus avoids the risk of extraneous arsenic, destroys organic matter completely, and causes no loss of arsenic, while the second process is incredibly elaborate and complicated, is rendered unsafe by the number of substances employed, and is altogether so ridiculous, that, although recommended by Rose, Wöhler, and especially by Otto, who occupies

in Germany the same position that Dr. Taylor does in England, it is not worthy of even a brief description in our standard work on Toxicology.

In endeavouring to prove that our author is incorrect in all these assumptions, and has been far too hasty in forming a decision without the test of experiment, it appears to be desirable to compare each step of the two processes, the chemicals employed, and the results obtained; but it may be remarked that the objection with regard to the number of chemicals used is of very little value to any one much engaged in these investigations, because he would naturally provide himself with a large stock of materials proved by himself to be pure, and would keep them for such purposes solely.

The process recommended by Dr. Taylor may be designated as I., that to which he objects so strongly as II., and each operation will be placed side by side, so that an idea may be obtained of the compartive complexity of the two processes, together with observations on each; it may be remarked also that the process II. is not exactly that recommended by Fresenius and Babo, but is the improved plan described by Otto, but which is by no means simpler than the original one:—

A I. The mass is heated with sulphuric acid. Very offensive odours are given off, and the operation is a lengthy one. The organic matter is not entirely removed even by long digestion, and there is great danger of a loss of arsenic. If chlorides be present, and they almost always are, the action of sulphuric acid will be to form volatile chloride of arsenic. It must be remembered that the quantity of poison present in the solid tissues is usually very small.

II. The mass is gently heated in a water bath with hydro-chloric acid and chlorate of potassa added. Chlorine is evolved and the operation can be finished in half an hour, or with the liver and kidneys in one hour at most. The organic matter is not entirely destroyed, but no arsenic can be volatilized.

The sulphuric acid used in No. I. must be pure, and the hydrochloric acid in No. II. must be the same. Here we have, however, an extra chemical, chlorate of potassa, the purity of which has to be ascertained, but as this salt never does contain arsenic, and is one of the purest salts in general use, the objection is not of much value.

B I. The carbonaceous mass is evaporated (carefully) to dryness, which operation will certainly occupy some hours.

II. The solution is filtered, and the residue washed out, which requires one hour at most.

C I. The carbonaceous mass is heated with nitric acid, which must of course be free from arsenic, and, as Dr. Taylor recommends, also free from hydrochloric acid.

II. Hydro-sulphuric acid is passed through the solution. No impurities can get into the mixture.

D I. The ash is washed with water, filtered, and washed out.

II. The precipitate is thrown onto a filter, and washed out.

E I. The solution is evaporated to dryness, treated with nitric acid, and evaporated several times (the term *several* may be assumed to mean three or four).

II. The precipitate is treated with ammonia, and the filtrate evaporated to dryness. Here we have an extra chemical, which must be proved to be free from arsenic. There does not seem, however, to be any possibility of its containing that substance; and among the numerous bodies in which that poison has been detected, to the best of the writer's recollection, ammonia has never been mentioned, although this of course does not preclude the necessity of proving its purity.

F I. The acid residue is neutralized with pure carbonate of potassa.

II. The residue is dissolved in nitric acid; long digestion is not necessary, and the operation is finished in a few minutes. Here the salt of potassa on the one hand, and the nitric acid on the other, must be free from arsenic.

G I. The solution is evaporated to dryness.

II. The solution is neutralized with carbonate of soda. The carbonate of soda used in the second process must be free from arsenic and from chlorine, which the ordinary pure salt used by chemists almost always is.

H I. The dry mass is washed with a little water, to extract the arseniate of potash (and filtered ?).

II. The solution is evaporated to dryness.

In I. a loss of arsenic may ensue from imperfect washing; it would be better to dissolve the whole.

I I. The solution can now be used in Marsh's test.

II. The residue has still to go through three operations, all of which are of the simplest kind, viz.: fusion in a porcelain crucible, treating with sulphuric acid until all the nitric acid is evolved, and solution in water. These, as the writer can testify, can all be completed in half, or at most, three-quarters of an hour, and the solution is then ready for Marsh's test.

It will be seen, therefore, that this incredibly complicated process consists of almost exactly the same number of operations as the one which Dr. Taylor so much prefers, inasmuch as the excess of three in the one mentioned in the last paragraph is counterbalanced by the repeated evaporations with nitric acid in the other. The time required would probably be about the same in both.

If we next examine into the number of chemicals employed, we find that sulphuric and nitric acids, and alkalic carbonate, are used in both cases, but in the process which is to be rejected on account of the enormous number of chemicals, three more are required, viz. hydrochloric acid, ammonia, and chlorate of potassa; the first is used by Dr. Taylor, in Reinsch's test, and must consequently be pure; the second is recommended by him in the process for the quantitative determination of arsenic (page 368), and must of course be equally pure, and there consequently only remains one extra chemical, chlorate of potassa, which as far as we know never contains arsenic, but be that as it may, the proof of its purity need not form an insurmountable difficulty.

Danger and Flandin allow that the carbonization process may cause a loss of arsenic, and Heinrich Rose, in his Handbook, distinctly states such to be the case. In the other process none can take place, as it has been shown by Schacht and others that no arsenic is evolved from its mixture with chlorate of potassa and hydro-chloric acid, unless the temperature be raised above that of boiling water. The arsenical solution finally obtained, is absolutely free from organic matter, which is of great importance, both in Marsh's test, and in the quantitative determination of the sulphide, while in the first process its complete removal depends on the repeated treatings with nitric acid, and this cannot be quite relied on.

Dr. Taylor recommends Reinsch's process as "applicable to the separation of arsenic from organic tissues without previous carbonization, the substance being digested with dilute hydrochloric acid, and then

boiled with copper gauze, this is introduced into a tube and heated, when a ring of arsenious acid is formed." The process is undoubtedly an excellent one where considerable quantities of arsenic are present and in experienced hands, but where the reverse condition occurs, the results are often very unsatisfactory. At page 367, Dr. Taylor allows that from the experience of Dr. Geohegan it appears that much arsenic is lost, and only one half is re-obtained in a crystalline form; this of itself should form an insuperable objection to the sole employment of this method where the amount of poison is small, and more particularly when it is desirable to ascertain its quantity. Moreover, in cases where sulphide of arsenic is present the test is inapplicable, as that compound is insoluble in hydro-chloric acid. It is also well known that various substances interfere with and prevent the reaction, althongh it is true they are not likely to be present in the case under consideration.

Dr. Taylor very correctly remarks that "the value of chemical evidence does not depend on the discovery of any particular quantity of poison in the stomach," and also, that "there is a strong prejudice among lawyers that the chemical evidence is defective, unless the quantity found is sufficient to cause death." The objections often raised in courts of law are unquestionably absurd, but they are raised, and if the chemist can meet them by determining with absolute certainty the quantity of poison existing in the viscera, it is his duty to do so, and as the votary of an exact science and in the discharge of a most responsible office, he will adopt that process which will enable him to report on this point with perfect accuracy, from the results of his own experiments, from absolute weighings, rather than one in which at the end he is obliged to make a mere estimate or to rely to a great extent on the assertions of others.

In regard to the quantitative determination, the second process leaves nothing to be desired, a measured portion of the final solution being treated with sulphurous acid, and the arsenic precipitated as sulphide, collected and weighed, or dissolved in ammonia, and the solution evaporated, &c. (The arsenic acid might also be determined as the ammonio-magnesian salt.) The same process is recommended by Dr. Taylor, but without previous destruction of organic matter, and hence the sulphide will scarcely ever be pure. "When we are dealing with the tissues the quantity of arsenic is generally too small for the application of this method, the liver containing only a few grains";

to this we must decidedly demur, as there is no difficulty whatever in determining the amount in a few ounces. The only real objection would be the question whether the arsenic is equally diffused throughout the whole mass of the organ, but this is believed to be the case. (See Orfila and Flandin.) "In order to determine the proportion of absorbed arsenic in an organ, (*e. g.* the liver) which under any circumstances can be done only approximately, we take a weighed quantity (four ounces), slice it and treat it by Reinsch's process, separate the whole of the arsenic by copper gauze, (may not some be lost during the boiling?) and determine or estimate the weight of the sublimates obtained, doubling this weight to allow for unavoidable loss, &c. I believe the quantity thus determined is always below the amount actually present. Some prefer to determine the quantity by passing the arsenuretted hydrogen generated in Marsh's apparatus through a weak solution of nitrate of silver, &c., &c., or of chloride of gold, &c., &c. In pursuing these methods, there may be a loss of arsenic in carbonizing and heating to dryness the organic matter with sulphuric acid, a portion of the arsenic is liable to be separated and deposited in the apparatus used; and it is not improbable that a portion combines with the reduced silver and gold."

It is to be hoped Dr. Taylor does not regard these as the latest improvements furnished by chemistry to medico-legal investigations, for anything more loose and unsatisfactory it would be difficult to conceive.

In conclusion, the writer in venturing to differ as to the value of a process from so eminent an authority as Dr. Taylor, is aware that the weight of greater experience is against him; but on the other hand the same opinion is entertained by several of the most distinguished German toxicologists with whom the process originated, and an experience of nearly all the poison cases which have occurred in Upper Canada during the last sixteen years, and a careful practical examination of all the methods hitherto proposed, may give some weight to the conviction that the process originated by Duflos, and improved by Wöhler, Fresenius and Otto is the best, the most reliable and the easiest of execution of all those proposed for the detection and determination of arsenic. Like all other untried operations it seems at first sight very complicated, the first trial may appear difficult, but every successive one will be easier, and the writer can

testify that, with proper diligence one person may effect the complete analysis of two or three substances in a couple of days. Even if the process were more difficult and more tedious, the heavy responsibility attaching to the experiment should lead us to adopt a process which will enable us to *give our evidence with absolute confidence*.

Since writing the above a trial has taken place in England of a Mr. Smethurst, on charge of administering arsenic, from the evidence on which, the objectionable character of Reinsch's test becomes very evident, and it is highly probable that had the examination, according to this process, been made by a less experienced and accurate investigator than Dr. Taylor, the arsenic would have escaped detection.

A certain solution was examined by Dr. Taylor by all the tests for arsenic which he thought proper, and none was found. Reinsch's test failed completely, for the gauze was destroyed. Eventually, however, in conjunction with Dr. Odling, the liquid was proved to contain arsenic and chlorate of potassa, and in the trial great stress seems to have been laid upon the action of this salt in "depositing the poison more fully and fatally on the coats of the stomach, and of preventing its detection in the viscera!"—(*Morning Star*, May 21st.)

Drs. Taylor and Odling, on failing to obtain reliable indications on the first application of Reinch's test, proceeded to remove the chlorine by repeated additions of copper gauze, the first experiments all failed, and yet Dr. Odling, in his evidence, states that "Reinsch's is the most certain of all tests."

It is impossible to imagine why the tests applied by Dr. Taylor did not succeed, for on making some experiments with a solution of one quarter of a graiu of arsenious acid in four ounces of a saturated solution of chlorate of potassa, no difficulty whatever was experienced in detecting it by the sulphate of copper, the nitrate of silver, and the hydro-sulphuric acid tests. Even the test with sulphate of copper and potassa succeeded partially; when more arsenic was added it answered perfectly. Reinsch's test, however, as found by Dr. Taylor, did not succeed, but if the other tests failed in his hands, it must have been from some other cause than the presence of chlorate, for the solution on which the above experiments were made, was sixteen times more dilute than that used by him. It is quite evident, however, that where chlorate of potassa is present, Reinsch's process is of no value, but it in no way hinders the separation of the arsenic by hydro-sulphuric

acid, and if the sulphide be converted into oxide, by means of potassa and oxide of bismuth, there would then be no difficulty in applying the copper test. Its presence in organic matter containing arsenic would of course prevent the application of Reinsch's process, but would in no way interfere with the other.

H. C.

The Ballads of Scotland. Edited by William Edmonstoune Aytoun, D.C.L. Edinburgh: .Wm. Blackwood & Sons. 1858.

The author of the "Lays of the Scottish Cavaliers," has here devoted himself to a task alike honorable and ambitious; for it is none other than to arrest the fleeting echos of tradition, and sift out from the labours of previous collectors and editors a standard and enduring text of the ballad literature of his native land. And no national minstrelsy is more worthy of such devotion. The songs of the Cid, and the metrical romances of Spain's Moorish era, have long been set forth in a recognized and standard text. Germany has her "Volkslieder der Deutschen;" Denmark her "Danske Viser;" Sweden her "Svenska Fornsänger." Nor is Scotland without her Song and Ballad Literature: from the "Miscellany" and "Evergreen" of Allan Ramsay, to the "Minstrelsy" of Scott, the "Ballads" and "Songs" of Chambers, and all the varied contributions of Ritson, Herd, Jamieson, Laing, Motherwell, and a host of minor workers in the same popular field of research. Not only is this the case, but so popular have been those ballads in earlier times, that—as we have English and Scottish versions of Border songs and ballads adapted to the prejudices and sympathies of rival nationalities, as where, in "The Flowers of the Forest,"

"The English by guile for ance wan the day,"—

so also we have traditional variations of the more popular ballads, adapted to special sympathies, localities, and personal characters, in the North, the Lothians, Ayrshire, and the Border dales. To say that one version is truer or more correct than another is now impossible. Each indeed has a local truth of its own; and it is only when, in the patch-work process of editorial collation, a jumble is made of all the diverse local variations of a favourite ballad,—and that, too,

rarely without the greater wrong of editorial liberties with such versions, in the inevitable cobbling which such a process involves,—that those ancient local adaptations in reality corrupt the text.

From his earliest years familiar with the traditionary poetry of his native country, and admitting its vigorous snatches to a stronger hold alike on his memory and his feelings than the epigramatic couplets of the poets of Queen Anne, or the most favourite lines of Horace: the author of the "Lays of the Scottish Cavaliers," and of some among the most piquant of our modern comic ballads, possesses many special qualifications for the task he has undertaken. Still further, he says, "I may add, that the idea of collecting and restoring, in so far as that was possible, the scattered fragments of the Scottish ballad poetry, in a complete form, has long been present in my mind, and has at various times, when leisure permitted, occupied much of my attention." With the natural indignation alike of a true poet and an enthusiastic literary antiquary, Professor Aytoun gives expression, in his introduction, to the disgust with which he has observed that much of the genuine floating minstrelsy of elder centuries, which had been gathered in various localities by diligent and faithful hands, but with little or no method or arrangement, "was being quietly pilfered for the purposes of transmogrification, and that various old favourites had been furbished, dressed up, and exhibited to the public, with applause, as novelties; and knowing well the value of much that remained," he adds, "I was not without apprehension that in the course of time the whole stock would be absorbed, to reappear in modern glitter and resonance, just as if a hidden treasure of unicorns, bonnet pieces, and Jacobuses, were to be discovered by a sly appropriator, and by him to be recast as medals bearing his own name and legend."

Those ancient ballads have gone through a curious process from first to last. *Published* originally in venerable Homeric style by recitation of the author himself, they have been subjected to such unintentional variations as are the inevitable consequence of oral tradition, and to this—more than to purposed change,—may be ascribed much even of that local variation, which makes the Aberdeenshire, the Ayrshire, and the Border versions of the same ballad so diverse. Again, the most popular ballads transmitted orally from generation to generation, partook inevitably of the changing fashions of the age, until we find the old song of the Percy and the Douglas,

in Sir Philip Sydney's words: "So evil apparelled in the dust and cobweb of an uncivil age."

> The Percy out of Northumberland
> And a vow to God made he,
> That he would hunt in the mountains
> Of Cheviot within days three,
> In the mauger of doughty Douglas,
> And all that ever with him be.

So sang the old English Minstrel of the fifteenth century, with graphic force and rough vigour, stirring the hearts of all as with the sound of a trumpet. Towards the end of the seventeenth and in the eighteenth century, readers congratulated themselves on possessing, in lieu of this, the refined and genteel paraphrase which delivered itself in such long-winded sing-song dogrel as follows; even Bishop Percy thinking it in many respects an improvement on the rugged simplicity of the elder minstrel:—

> God prosper long our noble King
> Our lives and safeties all;
> A woefull hunting once there did
> In Chevy-chace befall;
>
> To drive the deer with hound and horn,
> Earl Percy took his way;
> The child may rue that is unborn
> The hunting of that day.
>
> The stout Earl of Northumberland
> A vow to God did make,
> His pleasure in the Scottish woods
> Three summer days to take;
>
> The chiefest harts in Chevy-chace
> To kill and bear away;
> These tidings to Earl Douglas came
> In Scotland where he lay;
>
> Who sent Earl Percy present word
> He would prevent his sport;
> &c. &c. &c.

This is an unquestionable ballad of England, alike in its ancient and modern forms; and takes its tone from the auditors it was designed for. But Scotland has her historical ballad of "The battle of

Otterburn" to set against it, opening with as rough and picturesque a vigor as old "Chevy Chace:"—

It fell about the Lammas tide,
When Muirmen win their hay,
That the doughty Earl o' Douglas rade
Into England to fetch a prey.

And he has ta'en the Lindsays light,
With them the Gordons gay;
But the Jardines wouldna with him ride,
And they rue it to this day.

The diverse Scottish and English variations of the same ballad are exceedingly curious, and frequently of great interest and value to the historian; but besides these, originating in the same national pride and rivalry which finds its modern expression in bulletins and professed histories,—like the French and English versions of Waterloo, —we have another set of ballad variations originating in an ancient literary piracy, somewhat akin to that black-mail levied by the modern American publisher on the English poet. After describing this species of "poetical foray," as practised between the minstrels of one district and another, Professor Aytoun thus proceeds in his discriminating introductory remarks:—

"Still more was larceny practised when the story was of foreign framing,—in other words, when it belonged to England. To make spoil of an English ditty was accounted perfectly fair; but the mere act of conveyance and appropriation did not suffice. It was necessary to recast the ballad in the Scottish dialect, and to give it a new locality, and sometimes names, so as to render it more agreable to a northern audience; and while engaged in the work of reconstruction the minstrel, as a matter of course, would give full scope to his ingenuity, and would use every means in his power to render the disguise effectual. Nor was this a one-sided practise only; for the English minstrels were in the habit of helping themselves freely from the stores of Scottish poesy. I have no doubt that several of the ballads included in the following series were originally English—in particular I would specify 'Lord Buchan,' 'Earl Richard,' and 'The Border Widow's Lament.' As a set-off to these, I think we may fairly consider the following ballads, which are current in England, 'The Three Knights,' 'The Outlandish Knight,' and 'The West

Country Wager,' as altered versions of 'Fine Flowers i' the Valley,' 'May Collean,' and 'The Broomfield Hill.' I am also inclined to give England credit for 'Hugh of Lincoln,' claiming for Scotland in return, an original right of property in 'The Heir of Linne.' It is possible that, if thorough restitution were to be made, the exchange would be on a much larger scale; but the above instances are sufficient to show that, independent of the pure Border ballads, a good deal of popular poetry has passed from England into Scotland, and *vice versâ,* and in the process of time has become acclimated in the soil of transference."

And as our Editor thus boldly discriminates between ballads of English and Scottish origin; so also he freely excises and cancels, with the view of producing a standard text of Scottish Ballad poetry, divested of the patch-work borrowed from other ballads of early date, and free from those modern interpolations, which, like the "new piece on an old garment," only make the rent worse. But after all the deteriorating influences of oral tradition, the vulgarising changes of a sorry reciter adapting himself to a rude auditory, and of the artificial tastes of later transcribers in displacing the racy homeliness of the older minstrelsy for polished phrases suited to ears polite; it is with great justice that Professor Aytoun remarks: "The marvel is, that we can still show so many fine ballads upon such a variety of subjects, considering the many changes which have taken place in Scotland since the period of their production."

This indeed is singularly interesting on many accounts. Since the oldest of these ballads were written Scotland has become one with her "auld enemy of England;" has changed from Catholic to Protestant, from a transitional episcopacy, with its tulcan Bishops and Abbots, to a rigid and severely minute discipline of Presbyteries and Synods; back again to an enforced Episcopacy, with Stuart dragonnades, and a death-defying fidelity to the Covenants and League, which finally secured the restoration of Presbytery, as a fruit of the Revolution settlement. But in spite of all these changes, popular tradition has been faithful to its poetic trust; while the genius which begat such historic lays, has survived to produce under strangely altered circumstances the like memorials of Union jealousies, Jacobite revolutions, and the changing manners of the eighteenth century. Commenting on some of the most marked characteristics of Scottish ballad-poetry, Professor Aytoun remarks: "A large portion of these ballads was undoubt-

edly composed previous to the Reformation; and in many of them we find traces of the prevailing mode of worship. Thus there are frequent references to the mass, to the virtue of holy water, and to the power of bells; but, on the whole, the allusions to religious ceremonies are less numerous than we might expect." In regard to this it is curious to note how ineradicable has been the impression produced on the national mind by the institutions of the ancient faith, in spite of the vigorous crusade of ecclesiastical discipline and public opinion conjoined, for upwards of three centuries. Pasch, Yule, Halloween, Beltane, Rude-day, Whit-Sunday, Candlemas, and various other rustic anniversaries, all survive as relics of the ancient faith, and are mostly commemorated still, by an unpremeditated but universal popular consent, according to the old style. Such a faithful popular tradition, in spite alike of modern creeds and almanacs, gives additional confirmation to the authenticity of those ancient ballad poems, transmitted with like fidelity through so many generations. It is quite in accordance with this tenacity of ecclesiastical traditions, that the oral poetry of the Scottish people should likewise "disclose a vast extent of popular superstition. In 'Tamlane' and 'True Thomas,' we have the apparition of the Queen of Elfin, that mysterious feudatory of Hell, whose temptations and delusions were made matter of evidence before the Presbyteries, long after the downfall of the Church of Rome,—who was supposed to have carried away from the field of Flodden our own valiant King James, not slain, but wounded, as Arthur had been conveyed by fairy hands to the vale of Avalon. Then there are the apparitions of the dead, whose repose in the grave has been disturbed, either because they have still to expiate some deadly sin, or because they have to recover their troth, or because they are disquieted by the voice of heavy mourning. Most beautiful, indeed, and pathetic is the manner in which these visitations are narrated. The 'Wife of Usher's Well,' in her agony for the loss of her sons, rebels against the chastisement of God, and lo—

It fell about the Martinmas,
When nights are lang and mirk,
The Carline wife's three sons cam' hame,
And their hats were o' the birk.

It neither grew in syke nor ditch,
Nor yet in ony sheugh;
But at the gates o' Paradise,
That birk grew fair eneugh."

And so they remain, these three drowned men, till the dawn approaches, with their mother tending on them in her short-lived joy, as seemingly her living sons returned. She wraps her mantle about them, and sitting down at their bedside, at length yields to sleep, ere the red cock crows, which warns them to be gone. A slight emendation on the text, as adopted by Professor Aytoun from the version given in "The Border Minstrelsy," seems here almost indispensable; as it is obvious from the second last stanza that—in the homely simplicity of this touching ballad,—before they depart, the dead sons hang up the mantle with which their mother has happed them:

> And she has made to them a bed,
> She's made it large and wide;
> And she's *happ'd* her mantle *them* about,
> Sat down at the bed-side.
>
> Up then crew the red cock,
> And up and crew the gray;
> The eldest to the youngest said:
> "Tis time we were away.
>
> "The cock doth craw, the day doth daw,
> The channerin' worm doth chide;
> Gin we be miss'd out o' our place,
> A sair pain we maun bide."
>
> "Lie still, lie still but a little wee while,
> Lie still but if we may;
> Gin my mother should miss us when she wakes,
> She'll go mad ere it be day."
>
> O its they've ta'en up their mother's mantle,
> And they've hung it on a pin:
> "O lang may ye hing, my mother's mantle,
> Eere ye hap us again!"

In the curious mixture of the birch gathered at the gates of Paradise, the pennance dreaded in case of their absence being discovered, and the grave's "channerin' worm;" there are striking illustrations of the undefined admixture of ancient superstition with the difficulty, which the popular mind still experiences, of conceiving any clear realization of a disembodied spirit, or of death distinct from "the wormy grave." The same homely pathos and tenderness mark the second part of "Clerk Saunders," a noble lover who is slain in the arms of May Margaret the King's daughter, and returns "a twelvemonth and a day"

thereafter, to claim his faith and troth, without which he cannot rest in his grave. She insists on her lover kissing her, though he warns her, that his mouth is cold and smells of the grave, and then in the same simple style of homely pathos as in the one already noted, the ballad proceeds thus, chiefly in dialogue :—

> "Thy faith and troth thou sall na get,
> And our true love shall never twin,
> Until ye tell what comes of women,
> I wot, wha die in strong travailing?"
>
> "Their beds are made in the heavens high,
> Down at the foot of our good Lord's knee,
> Weel set about wi' gillyflowers;
> I wot sweet company for to see.
>
> "O cocks are crowing a merry midnight,
> I wot the wild-fowl are boding day;
> The psalms of heaven will soon be sung,
> And I, ere now, will be missed away."

May Margaret then, by a curious process, returns her lover's troth, and he leaves her with the tender assurance, that :—

> Gin ever the dead come for the quick,
> Be sure, Margaret, I'll come for thee."

But she follows the departing spirit, without waiting to cover her naked feet; and still we find the same simple and child-like confusion of ideas which makes the grave not only the portal to the spirit-land, but the sole spirit-world:

> "Is there ony room at your head, Saunders?
> Is there ony room at your feet?
> Or ony room at your side Saunders,
> Where fain, fain, I wad sleep?"
>
> "There's nae room at my head, Margaret,
> There's nae room at my feet;
> My bed it is full lowly now:
> Among the hungry worms I sleep.
>
> "Cauld mould is my covering now,
> But and my winding sheet;
> The dew it falls nae sooner down,
> Than my resting-place is weet.

"But plait a wand o' the bonnie birk,
  And lay it on my breast;
And gae ye hame, May Margaret,
  And wish my saul gude rest."

Of a different and more elevated character, yet marked by the same genuine simplicity, is the allegorical ballad of "The bluidy Sark," written by Robert Henryson, in the fifteenth century. The plot of this ancient ballad is in the style of medieval romance, and represents the rescue of a royal maiden from the dungeon of a foul giant; but the prince who rescues her perishes in the encounter, and she ever after preserves his "bluidy sark" as the memorial of her faithful knight. The ballad thus concludes :—

So well the ladye loved the knight,
  That no man would she take;
So should we do our God of might,
  That did all for us make:
Who fullyly to death was dight,
  For sinful manis sake;
So should we do, both day and night,
  With prayers to Him make.

There then follows a "Moralitas" or interpretation of the allegory, of which one stanza will suffice :—

The soul is Godis daughter dear,
  And eke His handywark,
That was betrayed by Lucifer,
  Who sits in hell full mirk;
Borrow'd by Christ his angel clear,
  Hain'd men! will ye not heark?
For his love that bought us dear,
  Think on the Bluidy Sark!

The curious old ditty "Allan-a-maut," presents us with a more popular phaze of allegory; while "Jamie Telfer o' the fair Dodhead," "Kinmont Willie," "Dick o' the Cow," and other rough spirited ballads of the old Border riders illustrate another aspect of the minstrel muse, and are full of life and vigour. A tragic tenderness mingles with the bold epic narrative of "Johnie Armstrong," the Border freebooter, hanged by James V. in 1528, under circumstances little consonant to the ideas of right and wrong among the Scottish borderers of the sixteenth century. Johnie Armstrong in vain sought to win the royal favour by offers of duty and service, such as abun-

dantly consorted with the feudal relations which had constituted the social bond throughout Europe for some five centuries, but were then beginning to give place to the germs of modern rule and subjection. When all hope of mercy was passed, tradition represents the Borderer to have said proudly to the King, nearly in the words of the ballad:—

> " To seek hot water beneath cauld ice,
> I trow it is a great follie;
> I have asked grace at a graceless face,
> But there is nane for my men and me:
>
> "But had I kenn'd, or I cam fra hame,
> How thou unkind wad'st been to me,
> I would have kept the Border side,
> In spite of all thy peers and thee.

Thus varied are the themes and modes of treatment of the ballads of Scotland, some of which have been the delight of fully fifteen generations, and still retain an undiminished hold on the national sympathies.

Whether ballad-editors will ever be agreed as to a precise version of our old favourites may admit of question; but it is certain that in this collection we have a carefully collected series of nearly all that are worth preserving, brought together, after the most cautious and discriminating revision of each, by an editor who combines the jealous acumen of the critic, the taste of the national poet, and the loving veneration of the antiquary. No better qualifications could be brought to the task, and the results fully accredit their diligent application.

To show how great a latitude the compass of editorial discretion can command, we shall refer to some of the changes that popular ballads have undergone in the new editor's hands. In Professor Aytoun's version of " Clerk Saunders," for example, we have eight stanzas omitted, which appear in Sir Walter's edition of it, while in lieu of these eleven others are introduced, derived from versions of Kinloch and Buchan; and the whole is, for the first time, divided into two parts. So again, in "The Wife of Usher's Well," considerable changes and additions occur, derived and modified from stanzas recovered by Mr. Robert Chambers; while it is divorced from an alliance which the latter had sanctioned between it and "The Clerks of Owsenford," and this again is relieved of sundry stanzas which its new

editor restores to "Gil Morrice." It manifestly requires a bold, yet discriminating hand thus to deal with the favourite versions of a national literature, only secondary in the strong hold which it retains on the affections of the people, to the songs which have been wedded to national airs. But while editorial critics will not be wanting hereafter with their conjectural emendations, new casts, and revised reconstructions; and infallibility is beyond the reach of the shrewdest diligence: it will be difficult to surpass the present editor in judicious critical acumen, or the no less indispensable elements of genuine poetic taste and reverential conservatism of the minutest fragment of the true antique.

His restoration of "Gil Morrice" is a good example of his mode of dealing with a hopelessly "ravelled skene." First, the "ingenious interpolations" of the contributors to Bishop Percy's "Reliques,"—which so roused the ire of old Ritson,—are expunged by wholesale; and no one can regret the erasure of such spurious antiques as the following:

> "His hair was like the threeds of gold
> Drawne frae Minerva's loome;
> His lipps like roses drapping dew,
> His breath was a' perfume!"

But besides such manifest interpolations, Mr. Jamieson's version had undergone a readaption to popular taste, by suiting it to the style of an age, prior to 1755; and this consisted not in verbal alterations, but in a recasting of the whole. It had been pieced with stanzas from other ballads, and eked out with counterfeits in the worst style of the eighteenth century. The process of its restoration is thus described by its present editor: "I have taken as a foundation the popular version recovered by Mr. Motherwell, from which many of the artificialities have disappeared. I have weeded from it every stanza which I consider to have been fabricated in the copy of 1755, replacing them, when that was possible, by stanzas from the imperfect old version printed by Mr. Jamieson; and I have cancelled the larcenous verses transferred from 'Lady Maisry.' The ballad, thus divested from its gauds, is at all events simple and unexaggerated."

To weed our ballad literature of all that is spurious, however, needs a singularly cautious and discriminating acumen, when we bear in remembrance the history, for example, of Cromek's adventures in search of Nithsdale and Galloway song. The author of the newer

"Reliques" bent on signalizing himself in the same field of literary adventure in which Percy, Scott, Ritson and others had already achieved so much, visited Dumfries in 1809, found out a young Scottish stonemason, then earning some eighteen shillings a week by his handicraft, but deeply versed in all the traditional and published poetry of his country, and as patriotically enthusiastic on the theme as ever the Ayrshire ploughman himself had been. The stonemason—long after familiar to all men as Allan Cuningham,—was himself a poet, and ventured modestly to show to the London critic some of the productions of his muse; but they were put aside with such a patronising condescension as sufficed to divert the disappointed poet's ingenuity into another vein. Cromek, returning to London, maintained a frequent correspondence with this Dumfrieshire peasant, and received from time to time the most wonderful fragments of ballads and songs, all welcomed by the delighted critic as precious relics of antiquity snatched from oblivion by his own sagacious skill, but every one of them the product of his despised protegee: the unknown Dumfrieshire mason! The credulous editor at length issued the collection, in 1810, under the title of "Remains of Nithsdale and Galloway Song;" and, as the son of the poet has since said: "No one suspected a cheat; Cromek's reputation, through the Reliques and the select Scottish songs, seemed sufficient security against that; and, as for the mason mentioned in the Introduction, no one could suspect for a moment that he could have written anything one-half so good." But the sport and the knavery did not end here. Jacobite songs played a prominent part in those wonderful fragments recovered from the recesses of Nithsdale and Galloway. The Ettrick Shepherd by and by published his *Jacobite Relics*, and took advantage of the treasures of Cromek's collection to enrich his own. Here and there he betrayed his suspicions of Allan's own genius discernible in the modern antiques; but neither Hogg's sagacity nor his honesty was proof against the clever deception, and, accordingly, we find him not only accepting some of them as genuine antiques, but even recovering new readings from "an older collection," or from other sources equally genuine with the originals! Allan Ramsay had taken like liberties at an earlier date, though with a less skilful hand, and in a far more artificial age; but the ablest critic must sometimes be at fault in sifting the grain of the true poet of modern times from that of his elder brother.

Some curious and exceedingly interesting notices regarding the

Scottish Minstrels, especially of the reign of James IV., are given in the Introduction, from the researches of Mr. Joseph Robertson in the books of the Lord High Treasurer of Scotland, including references to "Blind Harry," and many others now forgotten. "I doubt," adds the editor, "whether the Court of good King René of Provence was more minstrel-haunted than that of James IV. of Scotland." But we must find room for one or two of our old familiar favourites of which we never tire; and here is the authenticated antique version of one of the most touching of Scottish ballads, and one which has been repeatedly imitated, but never so successfully as to equal the touching and simply natural pathos of the original. The story is still preserved among the local traditions of Dumfrieshire, where the graves of Helen and her lover are pointed out. During one of their interviews on the banks of the river Kirtle, a rejected suitor, whose addresses were favoured by the lady's friends, suddenly appeared on the opposite bank of the stream, and, in his jealous rage, levelled his carabine at the breast of his rival. Helen, throwing herself before her lover, received the bullet in her bosom and died in his arms. A desperate combat immediately ensued, which only terminated by the fall of the murderer, who was cut to pieces by his maddened foe. The lover's moan was thus pathetically rendered by some true but nameless old minstrel, and tradition has been faithful to the trust:—

HELEN OF KIRKCONNELL.

I wish I were where Helen lies!
Night and day on me she cries;
O that I were where Helen lies,
On fair Kirkconnell lee!

Curst be the heart that thought the thought,
And curst the hand that fired the shot,
When in my arms burd Helen dropt,
And died to succour me!

O think ye na my heart was sair,
When my love dropt down and spake nae mair!
There did she swoon wi' meikle care,
On fair Kirkconnell lee.

As I went down the water side,
None but my foe to be my guide,
None but my foe to be my guide,
On fair Kirkconnell lee—

I lighted down, my sword did draw,
I hacked him in pieces sma',
I hacked him in pieces sma',
For her sake that died for me.

O Helen fair, beyond compare!
I'll weave a garland of thy hair,
Shall bind my heart for ever mair,
Until the day I dee!

O that I were where Helen lies!
Night and day on me she cries;
Out of my bed she bids me rise,
Says "Haste and come to me!"

O Helen fair! O Helen chaste!
Were I with thee I would be blest,
Where thou lies low and takes thy rest,
On fair Kirkconnell lee.

I wish my grave were growing green;
A winding-sheet drawn o'er my e'en,
And I in Helen's arms lying
On fair Kirkconnell lee.

I wish I were where Helen lies!
Night and day on me she cries,
And I am weary of the skies,
For her sake that died for me!

It may seem almost superfluous to quote this old familar piece; but his ear must be strangely jarred to whom its recurrence is unwelcome. So too is it with the fine old ballad of "Sir Patrick Spens" here given, with a slight but judicious conjectural emendation, and assigned, in theme at least, to the year 1281;—with the curious old fairy ballad of "Tamlane," another relic of undoubted antiquity, referred to in the "Complaynt of Scotland," printed in 1549;—and with the singularly tender "Lament of Lady Ann Bothwell," the daughter of Adam, Bishop of Orkney, who performed the marriage ceremony between Queen Mary and the Earl of Bothwell. Instead of these, however, we prefer selecting an exceedingly simple and less familiar ballad, which has, nevertheless, gone through sundry versions, and has furnished to its present editor an opportunity for some of his most judicious amendments and selected reconstruction:—

THE WOOD O' WARSLIN'.

"O will ye gae to the schule, brother,
Or will ye gae to the ba'?
Or will ye gae to the wood a-warslin',
And there we'll try a fa'?"

"It's I winna gae to the schule, brother,
Nor will I gae to the ba',
But I will gae to the wood a-warslin',
And its there that ye maun fa'."

They warsled up, they warsled down,
Till John fell to the ground,
And there was a knife in Willie's pouch,
Gied him a deidly wound.

"O lift me, brother, on your back,
Tak' me to yon burn clear,
And wash the bluid frae aff my wound,
And it will bleed nae mair!"

* * * * * *

He's taken aff his holland sark,
And riv'd it gair by gair;
He's stapt it in the bluidy wound,
But aye it bled mair and mair.

"O brother dear, ye'll lift me up,
Take me to Kirkland fair,
And dig a grave baith wide and deep,
And lay my body there!"

"But what shall I say to my father dear,
When he speirs for his son?"
"Say that ye left him at Kirkland fair,
Learning in schule alone."

"But what shall I say to our ae sister
When its—'Willie, O where is John?'"
"Ye'll say ye left him in Kirkland fair,
The green grass growing aboon."

"And O what shall I say to our mother dear,
Gin she cry,—'Why tarries my John?'"
"O tell her I lie in Kirkland fair,
And hame will I never come!"

Professor Aytoun has restored the simple pathos and tender interest of this little ballad by ejecting an intruded stanza which made the

wound deliberate instead of accidental; and he has further improved on one of its current versions by getting rid of certain foreign ingredients mingled with its genuine stanzas, probably at a very early date; and derived from the ballad of "Edward" one of the most powerful and sternly tragic of all the ancient traditional poems of Scottish folk-lore. It thus opens:—

"Why does your brand sae drap wi blude,
Edward, Edward?
Why does your brand sae drap wi blude,
And why sae sad gang ye, O?"

To these inquiries of his mother, her son renders various evasive replies until at length he admits that it is the blood of his own father dear that drops from his sword; and, replying to her further interrogatories desparingly, that he means to fly far over the sea, and leave his hall and towers to crumble into ruin,—it thus concludes:—

And what will ye leave to your bairns and your wife,
Edward, Edward?
And what will ye leave to your bairns and your wife
When ye gang over the sea, O?
Mither, mither,
The warld's room: let them beg through life;
For them never mair will I see, O.

And what will ye leave to your ain mither dear,
Edward, Edward?
And what will ye leave to your ain mither dear?
My dear son now tell me, O?
The curse of hell frae me shall ye bear,
Mither, mither:
The curse of hell frae me shall ye bear,
Sic counsels ye gave to me, O!

That the task of the Scottish ballad collector is scarcely yet completed, is proved by the fact that the editor of these "Ballads of Scotland" has still, like his predecessors, ancient novelties to produce, as in his traditionary version of "The Battle of Harlaw;" a spirited historical ballad, replete with local names and allusions, and which is still popular in Aberdeenshire, where it was taken down, from recitation, some years ago. It is pleasant to believe that the field is not yet so thoroughly gleaned as to preclude all hope of still recovering more of such golden grain as this new-found version of

"The brim Battil of the Harlaw," even though it should prolong the period during which the forger of antiques may ply his ingenious frauds. Amid all the richness of Scottish traditionary song, extending from the thirteenth to the eighteenth century, it has frequently surprised us that so little survives of the genuine minstrelsy begot by the tragic incidents of Flodden's fatal field. It is not, indeed, the custom of any nation to celebrate its defeats in song; but we have good evidence that the tragic romance, which gathers around the close of the remarkable reign of James IV., was not all reserved for the the appreciation of "the last Minstrel." Professor Aytoun gives us Johnson's spirited version of the surviving fragment of "The Souters of Selkirk," believed to embody the popular anathema on Lord Hume's pusillanimity, or treachery, to which the Scottish defeat was ascribed on the Northern Border:

> Up wi' the souters o' Selkirk,
>   And down wi' the fazart Lord Hume!
> But up wi' ilka braw callant
>   That sews the single-soled shoon;
> And up wi' the lads o' the Forest,
>   That ne'er to the Southron wad yield;
> But deil scoup o' Hume and his menzie,
>   That stude sae abiegh on the field!

Then we have "The Flowers of the Forest," with its ancient tune and fragmentary lines, and the simple, affecting image surviving in its stray couplet:

> "I ride single on my saddle,
> For the flowers of the forest are a' wede away."

Sir Walter Scott tells us, in the notes appended to it in his "Minstrelsy:"—"The following well-known and beautiful stanzas were composed many years ago, by a lady of family in Roxburghshire. The manner of the ancient Minstrels is so happily imitated, that it required the most positive evidence to convince the Editor that the song was of modern date." The lady was Miss Jane Elliot, the daughter of Sir Gilbert Elliot, of Minto, who died in 1766, Lord Justice-Clerk of Scotland. But did Miss Jane Elliot really write this beautiful song, so admirably re-producing the spirit and feeling of the old Minstrels, and so little in unison with the verse of the eighteenth century, about the middle of which she is affirmed to have produced it? We confess we have long had our doubts. Mr.

Robert Chambers tell us in his "Notes," on the authority of one who was admitted, in youth, to the privileges of Miss Jane's conversation, "that she was a remarkably agreeable old maiden lady, with a prodigious fund of Scottish anecdote, but did not appear to have ever been handsome." We have talked of her with the late Charles Kirkpatrick Sharpe, who had known her in his earlier days; and on our expressing to him our belief in the antiquity of the song, he remarked, in his dry, sarcastic way: "I don't believe Miss Jane would tell a lie, and she said she wrote it; but if so, it was all she wrote, and she never seemed capable of anything half so good!" Neither of these recollections of the reputed poetess can be regarded as worth very much in their bearing on the actual question of authorship. But it does not appear to be known to such later editors of Scottish Songs and Ballads as we have access to, that this song—for which Sir Walter Scott coufesses himself indebted to Dr. Somerville,—was in print nearly thirty years before. It is to be found in the appendix to a volume entitled "An exact and circumstantial History of the Battle of Floddon, in verse, written about the time of Queen Elizabeth: published from a curious M.S. in the possession of John Askew, of Palins-burn, in Northumberland, Esq. With Notes, by Robert Lambe, Vicar of Norham-upon-Tweed." This curious volume, printed and sold by R. Taylor, Berwick-upon-Tweed, 1774, includes pieces relating to Floddon, from Fulwell, Skelton, and other early poets; and among these, "The Flowers of the Forest," under the title of "An Old Scotch Song on the Battle of Floddon, fought A. 1513." As it differs in various points from the current version, and seems to have escaped the notice of modern editors, we give it here entire. The editor adds in his notes: "The tune to this song, called *The Flowers of the Forrest*, is a pretty, melancholy one:"

I have heard of a lilting, at our ewes milking,
　　Lasses a lilting, before the break of day;
But now there's a moaning, on ilka green loaning,
　　That our braw forresters are a' wede.

At boughts, in the morning, nae blyth lads are scorning;
　　The lasses are lonely, dowie, and wae;
Nae daffin, nae gabbin, but sighing, and sabbing;
　　Ilka ane lifts hae leglen, aud hies her away.

At e'en at the gloming, nae swankies are roaming,
  Mong stacks, with the lasses, at bogle to play;
But ilka ane sits dreary, lamenting her deary,
  The Flowers of the Forest that are a' wede away.

At harrest, at the shearing, nae youngsters are jeering,
  The bansters are runkled, lyart, and grey,
At a fair, or a preaching, nae wooing, nae fleeching,
  Since our braw forresters are a' wede away.

O dool for the order, sent our lads to the border:
  The English for anes by guile gat the day.
The Flowers of the Forest, that ay shone the foremost,
  The prime of our land, lies cauld in the clay.

We'll hear nae mair lilting, at our ewes milking,
  The women and bairns are dowie, and wae.
Sighing and moaning, on ilka green loaning,
  Since our braw forresters are a' wede away.

The same volume from whence this copy of "The Flowers of the Forest" is derived, has a version of "Sir James the Rose," or "The Buchanshire Tragedy" as it is called, differing both from the one given in Professor Aytoun's volumes, and from others referred to in his note. It is stated to be the production of "a very ingenious young lady, Miss Christian Edwards, daughter of a gentleman in Stirlingshire," and it fully bears out, in its style, the date assigned to it. Nor need any one question the date or authorship of Mrs. Cockburn's version of "The Flowers of the Forest," which is said to have referred directly to pecuniary losses which weeded out some of the popular land owners, the "Flowers of the Forest" of the authoress's own day. Beautiful as it is, it manifestly belongs in its mode of thought to the eighteenth century. No one familiar with our old ballad literature would ascribe to ancient Scottish minstrelsy the fine stanza, so expressive when heard wedded to its plaintive music:

    Oh, fickle Fortune,
    Why this cruel sporting?
  Oh, why still perplex us, poor sons of a day?
    Nae mair your smiles can cheer me,
    Nae mair your frowns can fear me,
  For the flowers of the forest are a' wede away.

But no such modern mode of thought is discernible in the older version, of which this was confessedly an imitation; and we strongly

incline to the belief that, if Jane Elliot had any hand in it, it was merely that of a transcriber from tradition, retouching a genuine ancient lyric orally preserved through successive generations, and giving it permanent currency in the fine form now familiar to all. It is curious, nevertheless, how many of our best modern Scottish songs and ballads are due to Scotland's daughters. To Lady Nairne we owe that exquisitely tender song, "The Land of the Leal," and the humourous and piquant "Laird o' Cockpen" and "John Tod;" while Lady Anne Barnard—one of the Lindsays,—gave us "Auld Robin Gray;" and Lady Grisel Baillie, daughter of the first Earl of Marchmont, wrote "Were nae my heart light I wad die." A melancholy interest has been added to the genuine mixture of humour and pathos in this fine song, from the application by Burns of one of its verses to his own condition, when, neglected by his country, his sun was setting ere it was noon. Besides these, such names as Miss Jenny Graham, Miss Blamire, Mrs. Grant, of Carron, Miss Cranston,—afterwards the wife of Professor Dugald Stewart,—with others of lesser note, occur among the writers of some of the best Scottish songs or ballads; not to mention Burns's Jean Glover, the authoress of "Ower the muir amang the heather;" and, according to the poet: a thief, and something worse! Mrs. Catharine Cockburn,—already referred to as the authoress of the later version of "The Flowers of the Forest,"—furnished other contributions to Scottish song, among which is the clever Jacobite version of "Clout the Caldron:"

> Hae ye ony laws to mend?
> Or hae ye ony grievance?

The Scottish poetesses, indeed, excel in humorous pieces, though also—as some of the above-named productions prove,—no less successful in the more congenial vein of tenderest pathos.

The following fragment of a ballad, relating to one of the old Flodden traditions, has already been printed in the "Memorials of Edinburgh," with a note stating its discovery in an interleaved copy of "Dalrymple's Remarks on the History of Scotland." We well remember, on showing the original to the late Charles Kirkpatrick Sharpe, his pouncing on the "shrowd" of the third stanza as an anachronism, betraying a modern hand,—at least in its latest transcriber. Imperfect and disconnected as it is, it seems worth preser-

ving, as, perhaps, a fragment of which other portions remain, giving shape to the ancient tradition of the escape of James IV. from Flodden, and his accomplished pilgrimage to the Holy Land, in accordance with early vows:

An' about the mids o' the night
He crap to the field o' the bluid;
Laigh he bowit, an' dour he lookit,
But never a worde he spak.

He turned the dead knight round about,
Till the moon shone on his bree;
But his soth was tined with a bluidy gash,
Drumbelee grew his ee.

"Up and awa, my lither foot-page,
An Scotland and I maun part;
But sweere by the dead, in ilk bluidy shrowd,
That thou layn my lare i' thy hart.

"Giffe I were a king, as now I'm nane,
Ille battell wold I prove,—
My birdie ladie in Holyroode;
Wae worth the wyt o' luve."

Sanct Giles sall ring ilk larum belle,
Wauk up the craimes and bowse,
Earl Angus has taen him to Floudenne,

* * * *

He cut the crosse on his right shoulder
O' claith o' the bluidy redde,
An' he's taen his ways to the holy land
Whereas Christe was quick and dead.

The line of distinction cannot always be clearly drawn between the song and the ballad. Many Scottish songs are truly epic, and even dramatic; while some of the pieces admitted into this critically digested collection are no less genuine lyrics. A further selection from the Scottish Song Book would be welcomed by the most fastidious admirer of the epic department of Scottish minstrelsy, in another edition of "The Ballads of Scotland," which we doubt not will be demanded ere long. To give to Scotland a standard edition of the grand, pathetic, and humorous fragments of elder song and tradition, for which she has been so long and justly celebrated, is an ambition worthy of the highest intellect. To this task Professor

Aytoun has evidently devoted himself lovingly, faithfully, conscientiously; and the result appears in these volumes, which cannot fail to be welcome to all who can appreciate true poetry, warbled in the wild wood notes and rude epics, of those simple and unlettered elder sons of song: the Scottish Makars.

D. W.

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

ATRYPA HEMIPLICATA.

Mr. Billings of the Geological Survey has discovered, by grinding off the beaks of several specimens, that Hall's *Atrypa hemiplicata* of the Trenton Limestone, is a true *Pentamerus*. Mr. Billings requests us to state also, that his *P. reversus* from the Middle silurian Series, is simply a large variety of the first named species [*P. hemiplicatus*].

AMERICAN TRILOBITES.

Mr. Salter has communicated to the Geological Society of London (Feb. 23, 1859) a brief notice of a new species of *Paradoxides*, *P. novo-repertus* (Salter), forwarded to him from Newfoundland by Mr. Bennet. It appears to be the largest species of that genus yet known, the example in question being 9½ inches broad. Mr. Salter has also described in the same communication a new species of CONOCEPHALUS, *C. antiquatus* (Salter) from a specimen brought from Georgia in 1851, by Dr. Feuchtwanger. These trilobites, in Mr. Salter's opinion, indicate the presence of Barrande's "Zone Primordiale," (hitherto of doubtful recognition) in our Western Continent. The imperfect trilobite from the Calciferous Sand Rock of Canada, formerly referred by Mr. Salter to *Paradoxides*, he now considers to be an *Asaphus*.

DEVONIAN PLANTS FROM GASPE.

Professor Dawson, Principal of McGill College, Montreal, has recently presented to the Canadian Institute a series of interesting fossil plants from the devonian rocks of Gaspé. The conditions of occurrence and general relations of these plants are described by Professor Dawson in a paper communicated to the Geological Society of London, on the 5th of last January. The following summary of this paper is quoted from the *Philosophical Magazine* of the ensuing month. "The plant-bearing rocks in the peninsula of Gaspé were first noticed by Sir W. E. Logan in 1843. To determine the fossil plants accurately, it was necessary to study them in place. With this view Dr. Dawson visited Gaspé last summer, and carefully examined the localities by the aid of the plans and sections of the Geological Survey of Canada. The strata referred to have a vertical thickness of 7000

feet, as estimated by Sir W. E. Logan. They rest on Upper Silurian rocks, and underlie the Carboniferous conglomerates; and some beds contain Lower Devonian brachiopods, &c.

Among the vegetable remains determined by Dr. Dawson is a curious genus termed by him *Psilophyton*, which belonged to the *Lycopodiaceæ*, [and was related in some respects, according to the author, to the modern genus *Psilotum*]. It had minute ad-pressed leaves on slender dichotomously-branching stems, with circinate vernation, and springing from a horizontal rhizome which had circular areoles with cylindrical rootlets. Some of the shales are matted with these rhizomes. Obscure traces of fructification are observable in cuneate clusters of bracts. The fragments of the different parts of this interesting plant might easily be mistaken for portions of fucoids, or of other and very distinct plants, such as *Karstenia. Halonia*, *Stigmaria*, *Schizopteris*, *Trichomanites*, &c. The author describes two species of *Psilophyton*, *P. princeps* and *P. robustus*. Dr. Dawson further described a new form of *Lepidodendron* (*L. Gaspeanum*); also some specimens of coniferous wood related to the *Taxus* (*Prototaxites Logani*), and some less clear forms belonging to *Knorria*, *Poacites*, &c. The author also noticed the occurrence of *Entomostraca* (*Beyrichia*), *Spirorbis*, occasional fish-remains, some brachiopods, and also rain-marks and ripple-marks in these Devonian beds."

Professor Dawson has also communicated to the Geological Society a paper of much interest, on "the Vegetable Structures" in Coal, an abstract of which will be found in the April number of the *Philosophical Magazine*.

POST-TERTIARY DEPOSITS OF THE ST. LAWRENCE VALLEY.

In the last number of the *Canadian Naturalist*, Professor Dawson makes some further additions to our knowledge of these interesting deposits, and figures many new forms of Bryozoa and Foraminifera obtained from them. Taken in connexion with the author's former researches on this subject, the present paper will be found of no ordinary value to the student of Canadian Geology. The following extract conveys some additional information respecting the well-known Beauport beds: "I visited this celebrated deposit for the first time last autumn. At first sight it consists of a mass of stratified sand and gravel, equivalent to the Saxicava sand of Montreal, and resting on boulder clay. The overlying mass is filled with *Saxicava*, *Tellinæ*, &c.; and the underlying boulder clay as usual contains no fossils. My experience in the Montreal deposits, however, led me to expect a bed, however thin, representing the Leda clay, between these; and on searching at the junction of the two great beds above mentioned, I was gratified by finding a layer of sand about three inches in thickness, filled with the rarer shells of the deposit, characteristic of its deeper waters, such as *Fusus tornatus*, *Pecten Islandicus*, *Buccinum ciliatum*, *Modiolaria discors*, &c.* The *Rhyneonella psittacea* occurs only in this layer, and in such a manner as to leave no doubt that it is buried here in situ, in the very spot where it lay anchored to the stones of the surface of the drift. On these stones, however, I found a new and interesting field for observation. In the thin layer above referred to, all the stones, as well as those that lay on the surface

* Sir C. Lyell notices the fact that these shells are more abundant in the lower part of the mass than above.

of the boulder clay or partly imbedded in it, were covered with the remains of marine creatures, especially *Balanus crenatus*, *Spirorbis sinistrorsa*, *Spirorbis spirillum*, *Lepralia* and *Hippothoa*. This layer, in short, evidently represented a time when the surface of the boulder clay, covered only by a thin layer of sand and stones, constituted the bottom of clear and deep water, before it became covered by the Saxicava sand. This bottom, although no clay has been deposited on it, represents the Leda clay at Montreal, and is exceedingly rich in the fossils usually found at the surface of that bed. *Foraminifera* occur in it, but they are comparatively rare, and so far as I could find, only of species common at Montreal." These facts, with others detailed in the paper, appear to confirm fully the threefold subdivision of our Post-Tertiary deposits, as established by the author from his previous researches, viz.: an underlying non-fossiliferous boulder clay; a deep-water bed of clay or sand, the "Leda clay" of Montreal, and the overlying shallow-water sands and gravels, the "Saxicava Sand" of Professor Dawson's original classification. Exclusive of doubtful forms, no less than sixty-three species of marine invertebrata have been obtained, chiefly by the author's explorations from these Post-Tertiary beds of the St. Lawrence Valley.

GEOLOGY OF CANADA, &C.

The May number of the Journal of the Geological Society of London contains an interesting sketch from the pen of Professor Ramsay, of our Surface Geology and Drift formation generally. Although containing nothing absolutely new, this paper may be consulted with much profit, as an able *resumé* of the known facts of the subject, classified and discussed with great perspicuity. To European Geologists it will be especially acceptable. The following is Professor Ramsay's summary of its contents: Glacialized condition of the Laurentine Mountains, and the drift-deposits of Montreal. Glacial drift of the plains; striæ; and roches moutonnées. Drift and striæ in the Valley of the Hudson, including the Canaan Hills and the Catskill Mountains. Probable equivalency of the upper clay drift of the Hudson Valley with that of Lake Champlain and of Montreal. Probable date of the Niagara Falls. Drift and other late Tertiary deposits at Niagara.

GNATHODON DEPOSITS OF MOBILE BAY.

In a brief notice, in the May number of *Silliman's Journal*, of the "Second Biennial Report on the Geology of Alabama" by the late Professor Tuomey, it is stated that the celebrated "gnathodon beds" of Mobile Bay, regarded as fossil deposits by Sir Charles Lyell and other geologists, "are, beyond doubt, accumulations made by the aborigines of the country. They are often in heaps, and contain ashes, burnt shells and charcoal, and bear no evidence of accumulation by wave action." The Report is edited by Professor Mallet, Chemist of the Alabama Survey.

CRETACEOUS FORMATION OF KANSAS AND NEBRASKA.

Most of our readers are probably acquainted with the fact that certain strata containing dicotyledonous leaves in great profusion and variety, have been recognized in different parts of Kansas and Nebraska. The true age of these fossil leaves, and their associated beds, is a question of so much geological importance,

that we are induced to give insertion to a somewhat copious extract from a paper on the subject, communicated to the Academy of Natural Sciences of Philadelphia, by Messrs. F. B. Meek, and F. V. Hayden. The presumed Tertiary age of these remains is disproved by the authors, on evidence of the most conclusive character. The beds in which they occur are shown, in many places, actually to underlie deposits containing *ammonites* (!) and *inocerami* (!); and these leaves, moreover, differ completely from those belonging to the true Tertiary deposits of the country. But we will let our authors speak for themselves:—

The Cretaceous system, as developed in Nebraska, is clearly divisible into five distinct formations, which have, for the sake of convenience, been numbered 1, 2, 3, &c., from the base upwards. Although at first entertaining some doubts as to whether No. 1, or the lowest formation, might not be older than Cretaceous, we always placed it provisionally, in our own published sections, in the Cretaceous system. More recently, after a careful review of the subject, we became satisfied, from the modern affinities of numerous dicotyledonous leaves found in this formation, that we hazarded little in regarding it as a settled question that it could not be older than Cretaceous, and so expressed ourselves in our paper read before the Academy of Natural Sciences, Philadelphia, March, 1858.

The reference of this formation to the Cretaceous, however, was not without some exceptions generally admitted, for Professor Jules Marcou, in his work on the "Geology of North America," page 143, refers it to the New Red Sandstone, and in a subsequent publication,* he places it in the Jurassic; while some investigators in this country also inclined to the opinion that it must be Triassic. In the midst of these conflicting opinions, although satisfied we were right, we wished, in order to remove all doubts from the minds of others, to have the opinion of some good authority in fossil botany, (a department of palæontology to which we have given little attention,) respecting the fossil leaves on which we mainly based our views in regard to the age of this formation. Consequently, we sent outline sketches of a few of them to Professor Oswald Heer,† the distinguished authority in fossil botany at Zurich, Switzerland, infoming him they were from a formation we regarded as Cretaceous, and requesting him to let us know to what genera and geological epoch he would refer them. This letter was sent to Professor Heer in August last, before we started to Kansas, and on our return, in the latter part of October, we were disapointed at finding no reply from him. After waiting some days longer, and receiving no answer from Professor Heer, we concluded our letter had either failed to reach him, or that he was unwilling to express an opinion based upon mere sketches of the leaves; consequently we submitted the whole to Dr. Newberry, who had then returned to Washington, and in whose opinion on this subject we have the fullest confidence.

After examining the specimens, Dr. Newberry gave us a written statement bearing date Nov. 12, containing a list of the genera to which he had referred the leaves, together with some interesting remarks and generalizations, in which he expressed the opinion that they are certainly Cretaceous, some of them belonging

* Notes pour servir a une description geologique des Montagnes Rocheuses, page 20.

† Our friend Dr. Newberry was then in New Mexico.

to genera peculiar to that epoch, and that the whole belong to more highly organized plants than anything known in the Triassic or Jurassic flora.

Knowing as we did that the rocks from which these plants were obtained—beyond all doubt,—hold a position beneath, at least, eight hundred feet of Cretaceous strata, containing great numbers of *Ammonites*, *Scaphites*, *Baculites*, *&c.*, it of course never once occured to us that any person might suppose it Tertiary.

About the thirteenth of November we sent to the American Journal of Science, a communication containing Dr. Newberry's list of the genera to which he had referred our plants, with some extracts from his remarks, all of which have appeared in the January number of that Journal. Some two or three weeks after we had corrected the last proof of this paper, we received (13th of Dec.) a letter from Professor Heer, bearing date of Nov. 20, in which he informed us that our letter had reached him at a late date, in consequence of his absence from home, and that after his return, other engagements had prevented him from replying sooner. In this letter Professor Heer, in accordance with our request, sent us a list of the genera, as near as it was possible for him to make them out from hastily drawn sketches, and also kindly furnished brief diagnoses of the species, stating at the same time that although one of the outlines resembles a Cretaceous genus (Credneria,) the nervation being obscure, and the others being more like Tertiary forms than anything known in the Cretaceous of the old world, he was inclined to the opinion that they are Tertiary.

Along with Professor Heer's letter, we also received a printed pamphlet entitled "*Letters on some points of the Geology of Texas, New Mexico, Kansas and Nebraska;* addressed to Messrs. F. B. Meek and F. V. Hayden, by Jules Marcou." In this pamphlet Professor Marcou quotes Professor Heer's conclusions in regard to our fossil plants, and expresses the opinion that No. 1, of the Nebraska section, is both Miocene and Jurassic, or in other words, that we have included in it strata belonging to each of these two widely different geological epochs.

Having a very high regard for Professor Heer's opinions on any question in fossil botany, where he has had an opportunity to examine the specimens themselves, or to study good figures and descriptions, we are quite sure, had the whole collection been submitted to him, instead of mere sketches of a few of the species, his opinion would have been very different. At any rate, we can assert with the fullest confidence it is absolutely *impossible* that this formation, or any part of it, can be Tertiary, for we know it passes, as already stated, beneath at least eight hundred feet of Cretaceous strata. This is not mere conjecture, nor an infereuce drawn from having seen this formation under circumstances leading us to *suppose* from the dip of the strata, that it must pass beneath the Cretaceous if continued in a given direction at the same angle of inclination, but from the fact that it has actually been seen, directly beneath the other Cretaceous rocks, not merely at one place, and by one observer, but by several persons at numerous localities.

In order to satisfy others we are not mistaken in this, we will give a few of the many facts in our possession, bearing on this question. In the first place, we would remark that the farthest point towards the south at which we have seen this formation, is near Smoky Hill river, in Kansas, latitude 38° 80′ north, and

longitude 97° 30′ west. Here we found it forming the upper part of several isolated elevations known as the "Smoky Hills," at an altitude of about 1200 feet above the Missouri at Fort Leavenworth. At this locality, however, we saw no rocks overlying it, and consequently have no *stratigraphical* evidence that it is the same rock seen by us at other localities under Cretaceous beds; but our lithological and palæontological evidence is quite conclusive on this point, for this rock in color, composition, and all other respects, is undistinguishable from No. 1, of the Nebraska section, as seen near the mouth of Big Sioux river on the Missouri, and contains numerous fossil leaves, some of which are identical with those occurring in No. 1, at the last mentioned localities. Amongst these leaves Dr. Newberry has also identified at least one genus (*Ettingshausiania*) peculiar to the Cretaceous system,

Bearing in mind that all the rocks here have a gentle but uniform inclination or dip to the north west; and that the formation under consideration consists of red and yellowish sandstones, and colored clays, with generally more or less impure lignite and ferruginous concretions, we will be prepared to recognize it at lower and lower elevations as we proceed northward.

Without undertaking to mention in detail the intermediate exposures, we will pass northward at once to localities where it has been seen beneath Cretaceous rocks by three different observers at various times; this is near the Kansas and Nebraska line—latitude 40° north, and in the vicinity of 97° of west longitude. Here at an elevation of above seven hundred feet above the Missouri at Fort Leavenworth, or some five hundred feet below the level of the exposures mentioned at the Smoky Hills, our deceased friend, Mr. Henry Prattan, saw near Wyeth's creek, in 1853, the following exposures in descending order:

1st. Slope, thickness not given.	
2nd. Yellow and whitish limestone filled with casts of *Inoceramus*, referred by him to *I. myteloides* =*I. problematicus*.	No. 3, Nebraska Sec.
3rd. Slope, thickness not given.	No. 2, Nebraska Sec.
4th. Red ferruginous sandstone with leaves of dicotyledonous trees.	No. 1, Nebraska Sec.

A short distance west of this exposure Dr. J. G. Cooper informs us he saw outcrops of red sandstone in the valleys at about the same elevation; and above this, exposures of dark gray laminated clay answering exactly the description of No. 2, of the Nebraska section, while above the latter, near the tops of the hills, he met with outcrops of light colored limestone containing numerous casts of *Inoceramus*.

At other localities not far to the southwest of the foregoing, Mr. Hawn saw exposures of light coloured limestone forty-five feet in thickness, containing great numbers of *Inoceramus* which we referred, from specimens sent by him, to *I. problematicus*. Below this there was a slope of twenty-seven feet in which he saw no exposures, while still lower he observed outcrops of dark ferruginous and yellow sandstone, and various colored clays with impressions of leaves resembling, as he supposed, those of oaks and willows. (See his section published by us in the Proceedings of the Academy of Natural Sciences of Philadelphia, May, 1857.)

Proceeding northward from the last mentioned localities, we find on reaching the Loup fork of Platte river, near the eastern limits of the Pawnee reservation, outcrops of the light colored *Inoceramus* beds already mentioned, (No. 3, Nebraska section,) near the water's edge; and at the mouth of Loup fork, on the Platte, the red sandstone No. 1, so often referred to, crops out near the river margin, while the *Inoceramus* beds are seen in the bluffs above it. Going down the Platte in a direction nearly contrary to the dip of the strata, we find this sandstone rising up so as to form near the mouth of Elk Horn river, bluffs some sixty feet in height. Here it seems to rest directly upon upper Carboniferous rocks. Continuing on down the Platte, we find this red and yellow sandstone rising higher and higher in the hills until we come within five or six miles of the Missouri, where it is seen with its base elevated near sixty feet above the Platte; and there are probably outliers of it between that point and the Missouri at greater elevations. So that we here find the same formation which at Smoky Hill river is elevated about twelve hundred feet above the level of the Missouri at Fort Leavenworth, and seven hundred feet above the same horizon near Little Blue river, has by the gradual north-westward dip of the strata, sunk to within about one hundred feet of the Missouri at the mouth of the Platte.*

Ascending the Missouri from the localities just mentioned, we see occasional exposures of the upper Carboniferous rocks, which gradually sink lower and lower until they pass beneath the river near Florence, to be succeeded by the reddish and yellow sandstones, &c., of No. 1,—(Nebraska section.) Above this, occasional exposures of this formation are seen with its characteristic fossil leaves, along the river; and at several localities, some thirty miles below the mouth of Big Sioux river, it forms perpendicular escarpments of yellowish sandstone, rising from ths water's edge to an elevation of about eighty feet; while at a higher point, back on the summits of the Hills, the same calcareous beds are seen containing *Inoceramus problematicus*. Here at a quarry in the sandstone (formation No. 1,) some twenty feet above the level of the river, one of us (Dr. H.) collected a large uumber fossil leaves, some of which are identical with species found by us in this rock at the Smoky Hill locality already mentioned. The sketches of leaves sent by us to Professor Heer were mostly drawn from specimens collected at this locality.

At the mouth of Big Sioux river a low bluff of this formation, not more than fifteen or twenty feet in height, is seen, and on the hills back a little from the river at a higher elevation the same *Inoceramus* bed crops out at several places, and is used for making lime. At another locality, about eight er ten miles up Big Sioux river, which comes in from the north west, one of us (Dr. H.) saw No. 1, containing its characteristic fossil leaves, *directly beneath* No. 2, of the Nebraska section.

* The gradual descent of the Missouri river makes its surface at Fort Leavenworth, about three hundred feet lower than at the mouth of the Platte, hence the exposures of No. 1, seen at the latter locality, one hundred feet above the Missouri, are some four hundred feet above the level of the Missouri at Fort Leavenworth, and of course about three hundred feet lower than the Little Blue river outcrops. The dip, however, is greater than this would indicate, for the strata incline towards the north *west*, while the mouth of Platte river, is north *east* of the Blue river localities.

This exposure presented the following beds in the descending order:

1st. 20 feet exposed of light gray limestone and marl, containing *Inoceramus problematicus.*	No. 3 of Nebraska Sec.
2nd. 45 feet dark laminated clay with ferruginous concretions containing fish scale.	No. 2 of Nebraska Sec.
3rd. 15 feet exposed above the edge of the water, consisting of yellowish friable sandstone, with a thin bed of impure lignite above, and some layers of various colored clay below, containing dicotyledonous leaves.	No. 1 of Nebraska Sect.

One of the sketches of a long lanceolate leaf, like some of the existing species of Salix, sent by us to Prof. Heer, was drawn from a specimen collected from one of the lower sandstones here.

Again at another locality on the Missouri, about thirty miles above the mouth of Big Sioux river, No. 1. was seen by one of us (Dr. H.) only five feet above the water's edge, and *immediately overlaid* by No. 2, of the Nebraska section, containing its characteristie species of *Ammonites:* and directly over the latter, he saw No. 3, containing *Inoceramus Problematicus.** At this locality he also found in No. 1, some of the same fossil leaves characterizing it at the other places already mentioned.

In ascending the Missouri, the last above named locality, formations Nos. 2, 3, 4 and 5 are seen to sink at the same gradual uniform rate of dip, in regular succession, beneath the level of the Missouri; so that on reaching Heart river, we find the top of No. 5 nearly down on a level with the water's edge, and a short distance above that locality it passes out of sight, to be succeeded by the Great Tertiary Lignite basin of the upper Missouri, which overlaps it on the hills along the river for some distance below.

From the foregoing statement, we think it will be clearly understood, that formation No. 1 of the Nebraska section holds a position *beneath* the other cretaceous deposits of that region; while the occurrence in it of highly organized angiosperm dicotyledonous plants proves that it cannot be older than Cretaceous. It may be argued. however, that it may in part be Cretaceous, and part Tertiary, or at any rate that *some* of these leaves may have been obtained from overlying Tertiary beds which we have confounded with the Cretaceous below. This, however, is impossible, simply because specimens of nearly all the species found at the various localities, have been quarried from the same bed at Blackbird Hill, and the whole —not a part only of this formation—passes beneath all the other Cretaceous rocks of the North west. In addition to this, we have extensive collections of plants from the Tertiary of Nebraska, not a single species of which is identical with those from No. 1.

When we stated in some of our papers that it was possible we might have included in this formation beds not belonging to the Cretaceous, it was not because we thought any part of it might be Tertiary, but because we suspected some of the

* It is of course unnecessary for us to inform geological readers that a rock overlaid by strata containing *Ammonites* and *Inoceramus* cannot be Tertiary, because these genera became extinct at the dawn of the Tertiary epoch.

ower beds referred to it in Kansas might possibly be Jurassic; and we are even now prepared to believe it may yet be found to repose on Jurassic rocks in that Territory, as it does at the Black Hills in Nebraska.

FORMATION OF OOLITIC LIMESTONES BY ORGANIC AGENCIES.

We translate the subjoined curious details respecting the formation of certain recent limestones in Mexico, from a paper by M. Virlet d'Aoust, contained in a late *Bulletin* of the Geological Society of France. After describing the well known position of the city of Mexico, and the lowering of the salt water lake of Tezcuco by artificial drainage, the author proceeds as follows:—"The lowering of this lake has necessarily exposed around its margin, the limestone deposit which constitutes its bed. This limestone, slightly marly and of a greyish or pure white color, is entirely of recent formation, as proved by the numerous fragments of obsidian knife-blades (*navajas de itztli*) which occur in the neighbouring soil, and which I have myself found imbedded in it, especially in the excavations at the west of the city, made by M. Griffon the architect, for the foundations of a new jail. I was struck by the oolitic texture which this limestone often presents, a character not observed by me in the fresh water limestone deposit of Lake Chalco. The oolitic granules appear identical in aspect, form and size, with those of many of the Jurassic oolites. I soon obtained an explanation of this structure. Being one day with M. Guillemain at the house of a mutual friend, Mr. J. C. Bowring, the distinguished chemist and superintendent of the salt-works of Lake Tezcuco, and calling attentien to the structure in question as seen in certain excavations which were then being carried on, Mr. Bowring informed me that the oolitic granules were nothing more than the eggs of a kind of fly, encrusted and cemented together by the calcareous sediment of the lake, which is constantly under process of deposition. . . . . . . This fact, the geological bearings of which were manifest, appeared to me so important, that I determined to verify it by personal observation. I therefore returned to the lake in the month of October, the time at which the eggs are chiefly deposited. I was accompanied by M. Guillemain, and by the chemists M. Ernest Craveri and M. Poumarède, who were no less anxious than myself to witness this novel formation. We were enabled to perceive perfectly, in the shallower parts of the lake, the manner in which the eggs were deposited. Myriads of little amphibious insects appeared upon the wing in countless numbers, and plunging, from time to time, beneath the surface of the water to the depth of several feet or even fathoms, they deposited their eggs upon the bottom of the lake or on objects more conveniently within their reach; after which they withdrew themselves from the water and probably died. These insects belong to the order *Hemiptera*, and constitute, according to M. Guérge Meneville, two distinct species, belonging, indeed, to different genera. One, and by far the more abundant of the two, is the *Corixa femorata*. The other, the eggs of which are larger, is the *Notonecta unifasciata*." M. Virlet d'Aoust remarks also in the course of his memoir, that the encrustation of the eggs is facilitated by the circumstance that each egg is attached to its sub-aqueous support, not directly, but by the intervention of a short pedicel. The eggs, furthermore, are collected by the natives in large quantities, and sold in cakes, as an article of food, under

the name of *haoutlé*. This substance was formerly considered to be a kind of marl or earth; and probably the greater number of the so-called "edible earths" of Central and South America are of an analogous composition.

MINERALOGICAL NOTICES.

Tetradymite (*Telluric Bismuth.*)—Dr. C. T. Jackson (*Silliman's Journal*, May, 1859) announces the occurrence of *Tetradymite* in Field's gold mine, *Dahlonega*, Georgia. It occurs in thick foliated masses, associated with native gold and auriferous iron pyrites in a quartz vein traversing hornblende slate. Color, steel-grey. Flexible, sectile, and soiling the fingers like graphite. H=2·25; Sp. gr. 7·868. One gramme yielded: Bismuth 0·7988; Tellurium 0·1800; Selenium 0·0118 Gold (mechanically mixed) 0·0060; Loss 0·0114.

Alisonite.—Under this name F. Field describes in the May number of *Silliman's*, *Journal*, a new species (?) from the Mina Grande near Coquimbo, Chili. Color; indigo-blue. Massive, with conchoidal fracture. H=2·5—3; Sp. gr. 6·10. Composition=Copper 53·63; Lead 28.25; Sulphur 17.00: corresponding to $3\,Cu^2S, PbS$. Plattner's *Cupro-Plumbite* also from Chili, gives $Cu^2S, 2\,PbS$. Mr. Field states, further, that the substance formerly described by him as new, under the name of *Guaycanite* (Sill. Jour. vol. xxvii, p. 52) proves to be the rare *Enargite* (Breithaupt.)

Boltonite.—Professor George J. Brush, in the above mentioned number of *Silliman's Journal*, has shewn in support of the views of Professor J. Lawrence Smith and in opposition to those of Kengott, that the *Boltonite* of Shephard, from Massachussetts, &c., is really identical in composition with *Chrysolite*: the combined MgO and FeO of ordinary chrysolite being represented in Boltonite by MgO alone. An analysis of a pure specimen, furnished by Prof. Shephard, afforded Prof. Brush the formula $3\,MgO, SiO^3$.

Saussurite.—Professor T. Sterry Hunt in an elaborate paper (also in the May number of *Silliman's Journal*) on *Euphotide* and *Saussurite*, has determined the latter substance, long considered an impure feldspar, to be a zoizite or "lime-alumina epidote"; or, at least, to be closely related to that species. The *Saussurite* analysed by Mr. Hunt was presented to him by Prof. Guyot. It formed a portion of the *Euphotides* of Mt. Rose, on which the original descriptions of de Saussure and Haüy were founded. The analyses show the oxygen ratios of the protoxides, peroxides and silica, to be nearly as 1 : 2 : 3, yielding the epidotic formula (as commonly received) $3\,RO, SiO^3 + 2\,(R^2O^3, SiO^3)$.) The following are the principal physical characters, according to Mr. Hunt:—Massive and very tough, with fine granular or compact structure, and sub-conchoidal or splintery fracture. Color, white, passing into greenish, bluish, and yellowish-white, rarely with flesh-red stains. Sub-translucent, with feeble, waxy lustre. H=7·0 (scratches quartz.) Sp. gr. 3·33—3·38. These characters coupled with Mr. Hunt's analyses, incline us in the present state of the question to look upon *Saussurite* as an epidote somewhat altered physically by prolonged metamorphic action, rather than as a distinct species. The blow-pipe comportment is not stated, but it would be interesting to ascertain it, as in the epidotes, both *per se* and with the ordinary reagents, the

blow-pipe characters are very peculiar. Of course the so-called *Saussurites* of many authors are still to be looked upon as mere feldspathic or rock mixtures.

Uranite.—M. Descloizeaux, in a long and valuable communication (*Sur l'Emploi des Propriétés Optiques Biréfringentes, pour la détermination des Espèces cristallisées: 2e. mémoire*) published in the 5th part, for 1858, of the *Annales des Mines*, announces the Uranite of Cornwall and Autun to belong to the Trimetric system of crystallization. This fact, first revealed by optical characters, was confirmed by the actual measurement of crystals. The crystals examined, although apparently combinations of tri-axial and bi-axial Dimetric pyramids with the largely developed basal plane, proved to be combinations of the latter with a rhombic octahedron and two domes, a macrodome and brachydome. The measured difference was, however, exceedingly slight. The base on the macrodome gave 109°6′, and on the brachydome 109°19′. The calculated prism-angle, also, only differs from a right-angle by 43′, so that M. Descloizeaux's determination must be considered to rest principally on optical characters. If, as maintained by M. Descloizeaux, *Uranite* and *Chalkolite* belong really to different systems, we strongly suspect that this will be found to apply to certain specimens only, in which the water atoms depart from the normal eight-atom type; and that, if Trimetric *Uranites* occur, Trimetric *Chalkolites* will be found also.

Liroconite (*Linsenerz*, Wern).—This mineral, hitherto regarded as belonging to the Trimetric system of crystallization, is stated by Descloizeaux (*loc. cit.*) to be Monoclinic. He makes the prism-angle $(\infty:\infty)=74°21'$, and the axial inclination $=91°27'$ and $88°33'$.

RIB FORMULÆ IN BRACHIOPODS.

At an evening meeting of the Canadian Institute, and afterwards in a note inserted in the January number of this Journal, we described a convenient method of denoting the number and situation of the ribs or plications on *Brachiopod* shells. In doing so, we were altogether unaware that a plan of a similar character had been previously adopted. We have since found, however, that a method essentially the same, was employed incidentally by Professor Hall, in his description of *Orthis* (*Delthyris*) *lynx*. We hasten, therefore, to make this acknowledgment, and to disclaim any intentional piracy. The method proposed by us, is merely an extension of a plan already followed, although, we believe, only in the instance referred to above, by Professor James Hall. This will be seen by the subjoined extract from Professor Hall's description of *Orthis lynx*:—"The smaller specimen 1*a*, has three plaits in the sinus and four on the mesial lobe, with seven on each side, thus: $7\ \frac{4}{3}\ 7$. In figures *c* and *d*, there is a full development of the $\frac{6}{5}$ medial plications and 10 lateral ones." The reader is requested to compare this with our note on page 53 of the present volume.

CANADIAN ORGANIC REMAINS.

Decades I. and IV. of this important publication have just been issued by the Geological Survey of Canada. We hope to notice these Decades in detail in an early number of the Journal. In the mean time we can remind our readers that copies can be obtained through any bookseller.

E. J. C.

CHEMISTRY.

VEGETABLE PARCHMENT.

The investigation of the action of acids on vegetable fibre has led to some very interesting discoveries, which promised at first to be of great technical importance, and although with some of them the expectations at first entertained have not been completely fulfilled, the most recent one seems likely to form the basis of an extensive branch of manufacture. It is well known that the action of strong nitric acid is to convert vegetable fibre into the so-called gun-cotton, a body which it was once supposed might replace gunpowder, but which is now used almost solely in the manufacture of collodion for photographic and surgical purposes. The long continued action of dilute acid converts vegetable fibre into grape sugar, which it was once supposed might be used as a substitute for cane sugar; although this has not been found to be the case, large quantities of it are manufactured for other purposes. It is also well known that the action of strong sulphuric acid on fibre, as in the form of paper, is to char or blacken it; but it is a discovery of only recent origin, that the action of sulphuric acid (diluted with a certain amount of water and properly cooled) on unsized paper is to convert it into a substance perfectly resembling animal parchment, and possessing many of its valuable properties. We have now before us a "Report on Vegetable Parchment, by Professor George Wilson of Edinburgh," printed on the parchment itself.

The altered paper resembles parchment. having more or less of a mottled appearance, which, to a certain extent, interferes with the distinctness of fine print; it is quite free from acid, has no gelatinous or amylaceous substance on its surface, is immensely strong, requiring great force to tear it, can be manufactured much cheaper than parchment, and perhaps even than sized paper, possesses apparently great durability, is not altered by boiling water as is the case with animal parchment, is scarcely acted on by any chemical re-agent, and being converted into the hard substance only on the surface, an attempt at erasure would expose the unaltered blotting paper below, which would at once reveal any attempt to write on the new surface. Prof. Wilson also states that it is free from the greasy surface which parchment often presents, to which we cannot quite agree, as the specimen before us is in some parts almost as difficult to write on as animal parchment.

The objections to this substance appear to be its liability to tear into two sheets owing to the existence of unaltered paper in the middle, its liability to decrepitate when strongly heated, and its power of resisting chemical re-agents which might be capable of entirely removing the marks of ink. The first defect, it is stated, may be remedied by using exceedingly thin paper, so that the whole mass of it may be changed; in that case, however, it seems probable that its property of exhibiting writing over an erasure would be destroyed.

Although not applicable to bank notes, it certainly is well adapted for all documents required to be durable, and which are not liable to erasure, alteration, or forgery.

RUTINE.

Schunck has obtained this yellow colouring matter which seems applicable to dying purposes, from the leaves of the buckwheat (*Polygonum fagopyrum*). He denies the existence of indigo in this plant. It appears to be the same substance as Rutine, Ilixanthin, and the body obtained from capers. The leaves contain about one thousandth part of the colouring principle.

SULPHATE OF BARYTA.

It has been mentioned in a former number that this salt is now extensively used as a substitute for white lead, but in order that it may be so employed it must be obtained by precipitation in an amorphous condition. In the process mentioned ante vol. iii., p. 521, the native sulphate is employed, but the carbonate may be dissolved in hydrochloric acid and precipitated by sulphuric acid. Pelouze has shown that the solid carbonate, without previous pulverization, may readily be converted into sulphate of the greatest tenuity, by digesting it with dilute sulphuric acid to which three or four per cent. of hydrochloric acid have been added.

This latter acid acts as a carrier of the baryta to the sulphuric acid, without it the process soon stops; its action is similar to that of the acetic acid in the Dutch process for manufacturing white lead.

It is curious that marble is not acted on in the same way, even a large quantity of hydrochloric acid scarcely increases the action at all.

DETECTION OF BLOOD STAINS.

Teichmann discovered that by the action of acetic acid upon blood crystals of the colouring matter may be obtained. Brücke finds that this test can be employed on exceedingly minute traces, the course adopted being as follows:

Some of the fluid obtained by extracting the spot with distilled water is put into a watch glass, mixed with a few drops of solution of chloride of sodium, and left to dry under the air pump with sulphuric acid. It is then inspected under the microscope to ascertain that nothing is there that could be confounded with Teichmann's crystals. The residue is then treated with glacial acetic acid and evaporated to dryness at a temperature of 212° F. A few drops of water are added, and the whole placed under the microscope. Crystals will then be apparent if blood were present.

OZONE.

Tait and Andrews have found if electrical sparks be passed through dry oxygen not more than one hundredth part is converted into ozone. A greater effect is produced by the silent discharge and a diminution of volume takes place amounting in one case to one thirty-fifth. On heating to 250° C., so as to destroy the ozone, the gas re-acquired its original volume. Hence the density of the modified oxygen thus obtained must be greater than in its unchanged condition, and it appears that it is also greater than it is in the ozone procured by electrolysis.

Mercury in contact with ozone loses its mobility to a great extent, and may be made to cover the surface of the tube with a fine reflecting surface.

The authors state that the discharge from the induction coil produces very insignificant ozonic effects. (This statement seems to require verification, as all who

have experimented with these instruments must have noticed a remarkably strong smell of ozone, which is frequently evolved. H. C.)

ICE.

It is well known from the experiments of Faraday and others, that during the freezing of water containing foreign ingredients many of them are eliminated, so that the ice produced is nearly if not entirely free from them; and it has been stated by the lamented Dr. Kane, that if the ice be formed from sea water at a sufficiently low temperature, it is so free from salt as to be available for the production of water for domestic purposes. This has been denied by Dr. Sutherland, who affirms that the ice contains one-fourth of the salt existing in the original water, and Dr. Walker, who acted as Surgeon and Naturalist to the Arctic Discovery Expedition, has communicated the results of his experiments to the Royal Society. He found that the quality of the ice varied with the temperature at which it had been formed, but in no case was its density less than 1.005 (in the form of water), and always contained so much chloride of sodium as to render it unfit for domestic use. He explains Dr. Kane's observation by supposing that his experiments were made upon ice formed from water generated by the melting of bergs, and which had flowed over the surface of the salt-water ice. Dr. Walker once observed a stratum of fresh water two or three inches in depth floating like oil on the surface of the sea water, this being in the neighbourhood of a glacier surrounded by bergs. Hummocks are often found, the upper portions of which yield fresh water, but in digging deeper into them the ice is always found to lose its freshness.

CLEANING PAINT BRUSHES.

Brunner recommends the following simple process for cleaning brushes used in oil painting and which have been allowed to dry. They are suspended for 12 or 24 hours in a solution of one part of crystalized carbonate of soda in three parts of water, kept at a temperature not exceeding 158° F. They can then be cleaned by washing with soap and water. H. C.

MISCELLANEOUS.

THE ATLANTIC TELEGRAPH.

BY J. A. BOYD,
*Undergraduate of Toronto University.**

I.

Bright skies shine on the placid deep;
'Thwart ocean be there not a breeze;
Let calmness brood upon the seas,
Peace on the charmed water sleep.

* To this poem the prize for English verse was awarded by the Vice-Chancellor, at the Convocation, held on the 8th June last. The author appends to it the accompanying note:—"The following composition has been written rather with the feelings of a contemporary

Ye winds, sheathe every harshest blast;
  Lap round, all softest atmospheres,
  The masts of those lone mariners:
So shall the work be done at last.

So shall the mystic coil be spun
  That weds the Old World with the New,
  And channeling vast ocean through,
One throb of common life shall run.

So shall be laid, with easy skill,
  A clue for lightning-footed Thought:
  Safe through sea-mazes shall be brought
Each messenger of good and ill.

Hereby shall flash whate'er man saith
  O'er wave-crowned Alp, wave-scooped ravine,
  O'er wave-smoothed wastes of changeless green,
In folded words of Life or Death.

II.

They talk of empery o'er the wave
  In high-toned, swelling words of boast;—
  How oft man's brief rule with the coast
Ceaseth,—beyond slopes deep his grave!

O! pray ye for those outbound ships,
  That they may slide through balmy noon
  Of day and night; pray that our moon—
Full moon of Hope,—have no eclipse.

Pray that they bridge the dread abime;
  Pray that the century's work be done—
  One cycle of events be run;
A better term begin of time.

And yet our hearts misgive for fear
  Lest they have sailed, and thrice! in vain;
  Our opening joy folds up again
And blooms not till a happier year.

---

observer than in the spirit of cold criticism, which looks from a vantage-ground of some six or eight months, upon the practical inefficiency of the Ocean Telegraph. However much this work has fallen short of the expectations expressed in the subjoined pages, it may not be doubted that the writer's words are prophetic of a triumph which this generation shall see. It is only a comfortable stretch of poetic license to keep our thoughts fixed on the glorious fact, that there have been subaqueous dialogues between Europe and America; and, if this be not enough, we can easily overleap the disappointments of a few months or years, and cast our eyes on that certain and not distant future, when the interrupted communication shall be resumed."

Oh, heart! they cannot, must not fail,—
  Man is of God, even if of dust.
  Science and Toil, with mutual trust,
Move forth—and nought may countervail.

For, skill of head and skill of hand,
  Heroic strength and godlike mind,
  In oneness for one task combine,
Have earnest thought and careful planned.

III.

Ah, woesome sight! with battered spars,
  Our ships from their mid-ocean cruise
  Return,—with seamen's wearied thews
And eyes that bless the peep of stars.

"And is your sea-craft foiled again?
  And come ye back even as ye went,—
  With all your precious stores unspent,
That else had dowered the homes of men?"

"Nay, nay! we come not as we went.
  We braved the storm, and did not shirk;
  We stemmed the waves and did our work,—
Our work hath full accomplishment."

"Now, welcome home, ye sons of toil!
  Ye valorous riders of the sea,
  Ye knights of modern errantry,
Fouled with no streak of battle-soil.

"This hard-won victory ye have gained
  Exceeds all sung of ancient time;
  Your names shall be in every clime,
Your bright renown by no blood stained.

"Bold offspring of those Vikings bold,
  Whose baby limbs the billows nursed,
  Stand forth confessed among our first—
Among the manliest of earth's mould."

IV.

Well spake the heart of Britain then,
  Casting her voice adown the sea:
  "To God, the Highest, let glory be,
And peace on earth, good will towards men."

Well uttered was that heaven-made hymn,
  Sung first to hail our SAVIOUR's birth,—
  That so, the peoples of the earth
Might join in praise the Seraphim.

From ocean-deeps, lo! pure and meek,
  As washed from earthly soil or taints,
  The words meet those of quiring saints:
Angels and men one language speak!

O! far-off-echoing song of praise,
  That swelled through Heaven's unpillared dome,
  For joy that CHRIST made earth his home
To teach upon the world's highways;

And sung once more full joyously,
  For that the foremost nations two—
  Who lead the Old World and the New—
Clasp earnest hands across the sea!

The strain from angel-harps began
  When Heaven and Earth were linked in one;
  And we prolong it, as the Sun
Sees world join world, and man join man.

V.

Meseems, the Atlantic's heaving floor
  Shrinks to a narrow, span-breadth water;
  Glad England greets her long-lost daughter,
And they shall sunder— never more!

O you! ye twain of kindred blood,
  Whom Science' hand has drawn so near,
  That each into the other's ear
Can whisper o'er the mediate flood;—

Ye twain of common kith and blood,
  By *Thought*, no less, together bound,
  Guide through long ages circling round
The following nations on to God!

Apostles of the Old and New!
  In actions preach the Word of Life:—
  With robes unstained by sordid strife,
Prove ye to your "high calling" true.

CANADIAN INSTITUTE.

(*Continued from last No.*)

SEVENTH ORDINARY MEETING—SESSION 1858–59.

5th February, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentlemen were elected Members :*

HENRY G. BOHN, York Street, Covent Garden, London, *Life Member.*

RICHARD A. HOSKIN, Esq., Toronto.

II. *The following donations for the Museum were announced, and the thanks of the Institute voted to the donor :*

T. C. WALLBRIDGE, ESQ., BELLEVILLE.

Two Geological Specimens.

III. *The following Papers were read :*

1. By Professor G. T. Kingston, M.A.
   " Meteorological Report for 1858."
2. By Professor D. Wilson, LL.D.
   " On the supposed evidences of an Ante-Columbian discovery of America."

EIGHTH ORDINARY MEETING—SESSION 1858-59.

12th February, 1858.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following donations to the Museum were received and the thanks of the Institute voted to the donors :*

1. FROM C. J. BETHUNE, ESQ., TRINITY COLLEGE, TORONTO.

A Box of Fossils.

2. FROM REV. V. CLEMENTI, B.A., PETERBOROUGH.

A specimen of the Beaver, stuffed.

II. *The following Papers were read :*

1. By T. J. Cottle, Esq., Woodstock.
   " On the Cranes of Canada."
2. By Prof. Chapman.
   " Remarks on certain specimens of Canadian Marble."
3. By Professor D. Wilson, LL.D.
   Notice of the Quigrich, an ancient Scottish Crozier, now in Canada.
   The relic, which is a large and beautiful object of silver gilt, was exhibited.

NINTH ORDINARY MEETING—SESSION 1858–59.

19th February, 1859.

JOHN LANGTON, M.A., Vice-President, in the Chair.

I. *The following donations to the Library were announced, and the thanks of the Institute voted to the donors :*

1. FROM R. S. M. BOUCHETTE, ESQ., TORONTO.

Bouchette's British Dominions in North America. 4to. Vols. 1 & 2.

Bouchette's Topographical Dictionary of Lower Canada. 4to.

2. FROM THE UNIVERSITY OF CHRISTIANIA.

Physikalsee Meddelesser, 1858.

Olaf den Helliges Saga.
Aslak Bolts Jordebog, 1832–1849.
Morphologie Végétale. J. M. Norman, 1857.
Sur Les Phenomenes d' erosion.
Inversio Vesicæ Urinareæ. L. Voss.
Zulu-Sprogets Grammatik, 1850.
Aubert Lateinischen Grammatik, 1857.
Symbolæ ad Historiam Antiquiorem Rerum Norvigiearum. P. A. Munch, Hist. Prof.
Graphlolitherne.
Forhaudlinger ved de Skandinaviske Naturforskeres Syvende Möde, 1. Christiania, Juli 1856.
Stastiske Tabeller for Kongeriget Norge, 1857.
Udtog of Norges Regia Historie Christiania.

II. *The following Papers were read:*

1. By E. Billings, Esq.,
"On the Fossil Corals of the Devonian Rocks of Canada."
2. By the Rev. Professor Young, M.A.
"The exact solution of general algebraical equations of every degree, in all cases where the roots or any number of them admit of being algebraically represented."
3. By the Rev. J. McCaul, LL.D.
"On some Mint Marks of the Lower Empire."

TENTH ORDINARY MEETING—SESSION 1858–59.

26th February, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Papers were read:*

1. By the Rev. Professor W. Hincks, F.L.S.
"The Sensational Philosophy respecting the Human Mind and its operations; the treatment it has met with, and its real character and pretensions."
2. By W G. Tomkins, Esq., C.E.
"On Comparative Tabular Meteorological Observations in Canada, England and Russia."

ELEVENTH ORDINARY MEETING—SESSION 1858–59.

5th March, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentleman was elected a Member:*

GEORGE REDPATH, ESQ., MONTREAL.

II. *The following donation for the Museum was announced and the thanks of the Institute voted to the donor:*

FROM PROFESSOR DAWSON OF MONTREAL.

Twelve specimens of Fossil plants from the Devonian Rocks of Gaspé.

III. *The following Papers were read:*

1. By William Hay, Esq., Architect.
"Some Remarks on Iron Construction as applied to Street Architecture."
2. By T. J. Cottle, Esq., Woodstock.
"On Two Rare Birds observed in Canada."

TWELFTH ORDINARY MEETING—SESSION 1858-59.

12th March, 1859.

JOHN LANGTON, Esq., Vice-President, in the Chair.

I. *The following donations for the Library and Museum were announced and the thanks of the Institute were voted to the donors:*

FOR THE LIBRARY.

1. FROM THE GEOLOGICAL SOCIETY OF FRANCE.

Bulletin de la Société Géologique de France. 7 Parts.

Annales des Mines, etc., in 1856 et 1857. 7 Parts.

2. FROM THE ROYAL SOCIETY OF DUBLIN.

Journal of the Society.

3. FROM J. M BRODHEAD, ESQ.

Vol. 9 of Explorations for a Railroad route from the Mississippi Valley to the Pacific Ocean.

4. FROM LA SOCIÉTÉ ROYALE DES ANTIQUAIRES DU NORD, COPENHAGEN.

Mémoires des Antiquaires du Nord pour 1840-1849. 2 Vols.

Saga Jatvardar Konungs hins helga.

Sur la Construction des Salles dites des Geants, par S. M. le Roi Frédéric VII de Denmark.

The Discovery of America by the Northmen.

Inscription Runique du Pirée interpretae par C. C. Rafn.

Extract des Antiquités de L'Orient.

Cabinet des Américaines à Copenhague.

Mémoire sur la Découverte de l' Amerique au Dixéme Siecle, par C. C. Rafn.

Société Royale des Antiquaires du Nord. Le Premier Janvier 1858.

FOR THE MUSEUM.

FROM JAMES WRIGHT, ESQ, TORONTO.

An Indian Pipe found in the Grave Mound of Bighead, Chief of the Pottawatamies at the Mouth of Bighead River, Meaford, C.W.

II. *The following Papers were read:*

1. By Dr. Morris.
   "On the Luminous Appearance of the Sea, commonly called Phosphorescent."
2. By Rev. J. McCaul, LL.D.
   "On some Ancient Inscriptions."

Mr. Armour gave the requisite notice of motion respecting certain payments due to the Society, to be brought forward at a subsequent meeting.

THIRTEENTH ORDINARY MEETING—SESSION 1858-59.

19th March, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentlemen were elected Members:*

EDWARD MILES, ESQ., C.E., TORONTO.

T. WARDLAW TAYLOR, ESQ., M.A., Barrister.

W. G. THOMPSON, ESQ., C.E., TORONTO.

OWEN ALEX. VIDAL, Esq., TORONTO. } as Junior Members.
BEAUFORT HY. VIDAL, ESQ., TORONTO. }

II. *The following donation for the Museum was announced and the thanks of the Institute voted to the donor :*

FROM G. B. WYLLIE, ESQ., TORONTO.

Fine Canadian specimen of the Lynx, stuffed.

III. *The following papers were read:*

1. By Professor Hind, M.A.

"On the Qu'apelle or Calling River, and the diversion of the waters of the South branch of the Saskatchewan down the Qu'apelle Valley to the Assinniboine River, and past Fort Garry into Red River, with a view to the establishment of direct Steam Communication from Red River to the foot of the Rocky Mountains, in a line nearly due west from Fort Garry."

2. By Rev. Professor W. Hincks, F.L.S.

"On the Canadian Species of Lynx."

3. By Professor Croft, D.C.L.

"Remarks on the more familiar experiments with Rühmkoff's Induction Coil."

FOURTEENTH ORDINARY MEETING—SESSION 1858-59.

26th March, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentleman was elected a Junior Member:*

ROBERT McINTOSH, ESQ., TORONTO.

II. *The Committee of Council appointed for the consideration of the question of arrears reported to the following effect:*

REPORT.

"The Committee to whom was referred the consideration of defaulters due their subscriptions for upwards of two years, report the following list of such, and recommend that notice be sent to each, intimating that unless the arrears are immediately paid up their names will be struck off the roll of members. The Committee further recommend that the *Journal* be forthwith stopped to all such members."

(Signed,) D. CRAWFORD, Convener.

(The list of defaulters was laid on the table with the report.)

The following papers were read:

By the Rev. C. Dade, M.A.

"On the Law of Storms."

2. By the Rev. J. McCaul, LL.D.

"New Readings of Old Inscriptions."

FIFTEENTH ORDINARY MEETING—SESSION 1858-59.

2nd April, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following Gentleman was elected a Member:*

HON. ALEX. KIERSKOWSKI, M.L.C.

II. *The following donations were announced and the thanks of the Institute voted to the donors:*

FROM REV. V. CLEMENTI, B.A., PETERBOROUGH.

A Skin of the Star Nosed Mole, and eleven specimens of Fossils.

III. On the nomination severally, of the President and the Members, Messrs Spreull and Cockburn were appointed Auditors.

IV. *The following Papers were read:*

1. By J. F. Smith, Jr., Esq.

"Notes on some of the more Characteristic Fossils of the Hudson River Group of Western Canada."

2. By Professor D. Wilson, LL.D.

"Notes on the Development of new Varieties among the Intrusive Populations of America."

SIXTEETH ORDINARY MEETING—SESSION 1858-59.

9th April, 1859.

Hon. G. W. ALLAN, President, in the Chair.

I. *The following donations for Library and Museum were announced and the thanks of the Institute voted to the donors:*

FOR LIBRARY.

1. FROM SMITHONIAN INSTITUTION.

Smithonian Contributions to Knowledge. Vol. X.

2. FROM T. D. HARRINGTON, ESQ.

Teneriffe, by Professor C. Piazi Smith.

FOR MUSEUM.

1. FROM T. D. HARRINGTON, ESQ.

A Collection of specimens of Mineralogy and Indian Pottery; one ancient Greek Coin found on the Eastern Coast of Sicily.

II. The following Report from the Council, prepared by the Committee to whom had been referred a proposed change of Name of the Institute, was read, and the President announced that the question would stand over for discussion till the general Meeting to be held on Saturday next:

REPORT.

"*To the Council of the Canadian Institute.*

"Your Committee having had under consideration the reference to them relative to the injuries already resulting, or likely to result to the Canadian Institute from its correspondence in name to the Mechanics' Institutes, 'The Institut Canadien,' and other bodies of a purely local nature, or formed for purposes altogether different from those aimed at by this Society, beg to report that: owing to the peculiar circumstances in which the Canadian Institue originated, the special objects most prominently set forth in its Charter of Incorporation pertain to the profession of the Land Surveyor, Civil Engineer, and Architect, although the Institute has long since abandoned this exclusively professional character, and become a strictly scientific society.

"Your Committee would therefore recommend that application be made for a New Charter, with extended privileges; and whereas the present charter was granted by His Excellency the Earl of Elgin, Governor General of the Province, Your Committee suggest that application be made for *a Royal Charter, under Her Majesty's own hand and seal;* and that in consideration of this, and to prevent any future confusion with other Canadian Institutions, Local or Provincial, the Institute

obtain authority therein for assuming, and using solely and exclusively within the United Province of Canada, the name of *The Royal Society of Canada*, *The Royal Academy of Sciences of Canada*, or such other special designation as shall seem best fitted to effect the object aimed at by a change of name.

"Your Committee would also submit for the consideration of the Council, whether, in preparing the draught of such a charter, provision should not be made for *a class of Fellows*, to be elected from among the working members of the standing of some fixed term of years, and under such restrictions as shall give a just value to the distinction, and reflect credit on the Institute, as representing the Science of the Province.

"All of which is respectfully reported."

(Signed,) G. W. ALLAN, Convener.

8th April, 1859.

III. *The following Papers were read:*

1. By John Langton, M.A.

"On the Age of Trees, and the future preservation of Canadian Timber."

2. By Professor C. Smallwood, M.D., LL.D.

"On the Meteorological Phenomena of Lower Canada, 1859."

EXTRAORDINARY GENERAL MEETING.

16th April, 1859.

Hon. G. W. Allan, President, in the Chair.

I. The President called attention to the Report of the Council relative to the proposed change of name of the Institute, and requested the opinion of the members thereon, when it was moved by Dr. Hodder, seconded by Thos. Brunskill, Esq., and carried, "That it be remitted to the Council to carry out the details of the report, relative to a new charter, and to adopt all steps relative to the change in the constitution of the society therein recommended."

II. *The following Papers were then read:*

By Edward Hodder, M.D.

"On the influence of the storms during the winter of 1858–1859 on the Peninsula, and the probable effects on the Esplanade and Harbor of Toronto."

On the motion of S. Fleming, Esq., seconded by F. W. Cumberland, Esq., the thanks of the Institute were then given to Dr. Hodder and the Gentlemen of the Toronto Yacht Club, under whose directions the investigation had been carried out.

It was then moved by F. W. Cumberland, Esq., seconded by W. Hay, Esq., and carried, that Messrs. Hind, Fleming, the President of the Institute and the mover, be a Committee to co-operate with the Yacht Club in devising measures for the preservation of the Peninsula.

2. By Sanford Fleming, Esq., C.E.

"On the Settlement of Wild Land."

III. The President drew the attention of the members to this, as the closing meeting of the session, and availed himself of the occasion to congratulate them on the prosperous condition of the Institute, and on the success which had attended the meetings of the season. In conclusion, he invited the members to a conversazione to be given at Moss Park, on Wednesday the 27th Instant.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—APRIL, 185[illegible].

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Days.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temp. of the Air 6 A.M.	2 P.M.	10 P.M.	M'N.	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Resul't.	M'N.	Rain in Inches.	Snow in Inches.
1	29.852	29.800	29.841	29.8370	27.7	40.7	33.5	34.70	−1.55	135	153	162	150	69	60	.84	73	N b W	E b S	N b E	N 49 E	0.4	8.2	5.5	4.68	6.05	...	...
2	.893	.715	.342	.5868	34.2	35.3	36.6	35.35	−1.23	129	113	142	126	68	54	66	61	N N E	E	E b N	N 78 E	7.4	12.8	19.8	16.08	16.13	0.065	Inap
3	.880	.129	—	—	36.9	44.4	—	—		162	201	—	—	74	68	—		E	W b S	W b S	S 75 W	7.0	20.7	23.0	19.85	20.78	Inap	.
4	.339	.340	434	3375	30.1	31.0	29.9	30.27	−7.07	137	075	095	101	81	42	57	60	W	W N W	W	N 78 W	20.4	25.5	10.5	16.91	17.07		0.3
5	.400	361	463	4185	26.3	31.0	29.9	29.13	−8.58	.115	069	117	103	81	51	70	64	N W b W	W b N	W b S	N 74 W	6.2	22.5	10.8	13.90	14.32	..	0.2
6	.496	.508	.540	.5147	29.2	39.9	35.3	34.22	−3.82	113	093	139	116	70	30	67	60	W b S	N W b W	W S W	N 85 W	8.4	13.2	9.2	9.96	10.22		Inap
7	.462	387	517	4552	32.4	43.3	35.9	37.39	−1.03	157	207	163	171	85	74	77	76	W S W	W b N	W	S 88 W	0.4	19.8	15.5	9.06	11.12	0.085	0.3
8	.588	.684	.905	.7225	31.0	36.1	27.4	31.60	−7.22	140	125	095	108	90	58	63	61	N W b W	N W b N	N N W	N 45 W	10.2	24.8	4.4	14.64	15.13		...
9	30.020	986	878	.9563	23.9	35.3	34.2	31.35	−7.18	109	105	139	112	85	51	71	63	N N W	S	E	S 71 E	4.4	10.2	6.6	4.60	8.53	.	...
10	29.760	.635	—	—	34.2	38.1	—		—	152	120		—	77	60	—	—	E b N	E b N	E b N	N 78 E	20.0	19.6	20.0	21.28	21.30	1.145	...
11	.066	.966	274	1317	37.1	44.7	42.2	41.20	+ 1.47	217	273	257	238	98	92	.95	92	E b N	E N E	N b E	N 65 E	25.2	8.8	2.8	7.00	9.37	0.250	...
12	.479	.631	636	5377	42.2	52.1	39.3	45.25	+ 5.12	203	156	206	189	75	39	.86	66	W S W	W	N E b N	N 66 W	5.3	14.8	3.2	5.28	8.91		...
13	.693	.638	.652	6310	37.1	44.7	42.2	41.89	+ 1.45	139	171	222	179	63	57	.82	67	N E b N	E	E b N	N 77 E	8.5	10.0	15.8	14.24	14.32	0.215	...
14	.270	28.998	257	1717	38.6	50.9	39.1	43.92	+ 2.18	224	331	068	176	95	91	27	63	E b N	S b W	W S W	S 16 W	25.5	6.5	10.4	3.81	17.02	0.685	...
15	.127	29.109	.169	1282	38.6	42.6	38.4	39.09	1.97	207	127	130	157	88	44	83	65	S S E	S W	N N W	S 49 W	12.0	19.5	7.6	11.63	13.55		
16	.224	318	.478	.3363	33.2	43.3	37.1	37.08	— 3.90	112	138	106	132	58	.47	75	58	S W b W	W	W N W	S 87 W	9.9	21.0	8.5	11.70	12.02	..	...
17	.522	.558	—		32.8	40.2	—		—	148	172			79	.68		—	W N W	S	N N W	N 66 W	3.5	6.2	10.0	3.59	7.19		Inap
18	.736	689	.652	6835	33.7	46.9	39.8	40.65	— 1.42	131	159	153	147	67	49	61	59	N W b N	S	W S W	S 27 W	12.0	11.5	6.0	4.47	7.31		...
19	.616	.574	651	6137	38.2	44.3	37.5	40.00	— 1.45	193	207	177	190	.84	60	79	.75	W b S	S b E	N W b N	N 33 W	0.4	5.2	6.6	5.60	7.55	Inap	...
20	.638	.654	.498	5550	38.9	48.9	40.0	42.93	+ 0.15	143	194	209	190	.60	65	85	66	N b W	E S E	Calm.	S 67 E	9.0	2.0	0.0	0.99	1.54		...
21	.461	.446	.453	4512	41.8	45.8	43.3	43.78	+ 0.09	174	147	226	180	64	47	80	63	Calm	E b S	N E b E	N 70 E	0.0	6.2	5.0	3.98	4.68		..
22	.498	371	—	—	41.8	45.8	—	—	—	159	152	-	—	59	49	—	—	N b E	E b S	N b E	N 37 E	4.0	7.2	14.0	9.11	11.00	..	0.1
23	.187	.098	126	.1385	35.3	38.8	40.7	37.55	— 6.15	161	152	065	147	88	.69	.32	.67	N b E	N N W	N W b N	N 28 W	19.6	22.0	25.2	22.67	24.15	..	0.3
24	.908	.834	—	—	36.4	50.8	—	—	-	070	075			31	19	-	—	W b N	W b N	W N W	N 70 W	18.4	20.5	2.0	11.79	12.49		..
25	.894	584	611	.6983	31.5	48.0	39.3	39.82	— 4.58	140	150	.222	173	84	46	.93	73	W N W	S S E	E b S	S 30 E	1.0	9.2	2.0	2.67	3.97	0.092	..
26	.557	.507	472	5097	39.7	45.8	42.9	43.22	— 1.42	214	234	138	192	87	75	.49	69	E	S E b S	N W b N	N 73 E	3.8	8.0	7.0	1.75	5.86	.	..
27	691	.716	772	7197	35.1	39.7	35.7	37.05	7.97	192	105	092	126	91	43	.43	57	N E b N	S S E	N b N	N 6 E	11.5	11.4	5.0	6.60	7.78	......	-
28	.843	871	.823	8450	38.4	50.3	40.4	44.00	1.40	100	053	106	096	43	14	.41	31	N N E	E b S	S E b E	N 88 E	5.2	8.8	1.8	4.57	5.21		.
29	.811	.748	.684	7438	43.3	59.9	47.3	51.27	+ 5.50	148	198	188	178	52	38	.56	48	N E	E S E	E S E	N 60 E	1.8	4.0	0.5	2.20	3.57	....	..
30	691	.709	.708	7053	51.6	61.3	49.1	54.67	+ 8.62	162	218	191	.180	42	40	.51	.42	N b E	S E b S	S E b S	N 84 E	10.2	4.2	1.5	4.16	5.18		
M'n	29.5378	29.5140	29.5537	29.5350	35.52	44.04	38.30	39.62	— 1.46	.187	.159	.158	.164	.75	.53	.66	.63	......	......	......	......	9.05	13.30	8.72	...	10.79	2.527	1.2

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR APRIL.

Highest Barometer.................... 30.046 at 8 a. m., on 9th } Monthly range=
Lowest Barometer .... 28.893 at 2 p. m. on 14th } 1.053 inches

Self-registering Thermom.
- Maximum Temperature .... 64°8 on p. m. of 30th } Monthly range=
- Minimum Temperature .... 22°6 on a. m. of 9th } 42°2
- Mean maximum Temperature .... 46°54 } Mean daily range=
- Mean minimum Temperature .... 32°92 } 13°62
- Greatest daily range .... 27°2 from a. m. to p. m. on 29th.
- Least daily range .... 5°9 from a. m. to p. m. on 2nd.

Warmest day 30th .. Mean temperature......... 54.67 } Difference = 25°54.
Coldest day... 5th . Mean temperature .... 29°12 }

Maximum { Solar .... 78°0 on p. m. of 30th } Monthly range=
Radiation. { Terrestrial .... 14°0 on a. m. of 9th } 64°0

Aurora observed on 7 nights, viz., on 7th, 8th, 12th, 21st, 23rd, 28th and 29th.
Possible to see Aurora on 17 nights impossible on 13 nights.
Snowing on 8 days,—depth, 1 2 inches duration of fall 21 3 hours.
Raining on 9 days,—depth 2 527 inches ; duration of fall 36.7 hours.
Mean of cloudiness = 0.59.
Most cloudy hour observed, 8 a. m., mean = 0.66 ; least cloudy hour observed, 10 p. m., mean, = 0.52.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
2469.73	1060.59	2533.62	3518.76.

Resultant direction N. 36° W. ; Resultant Velocity 2.33 miles per hour.
Mean velocity.................... 10.79 miles per hour.
Maximum velocity .... 32.2 miles, from 8 a. m. to 9 a. m. on 14th.
Most windy day..................... 23rd Mean velocity 24.15 miles per hour.
Least windy day .... 20th Mean velocity 1.54 ditto.
Most windy hour .... 11 a. m. to noon .. Mean velocity 14.42 ditto. } Difference
Least windy hour .... 9 p. m. to 10 p. m. Mean velocity 8.17 ditto. } 6.25 miles.

1st—Faint Solar Halo, from 11 a. m. to 1 p. m.
2nd—Hail shower, from 10 p. m.—3rd. Fog at 6 a. m.
9th—Solar Halo at 8 a. m.—11th. Dense Fog from 6 p. m.
13th—Perfect Lunar Halo, from 7 to 9 p. m.
14th—Fog, 1 to 2 p. m. Hail shower, 4 p. m., and Rainbow at 6.15 p. m.
19th—Perfect Solar Halo, from 7.30 to 10 a. m.
23rd Very cold stormy day.
25th—Perfect Solar Halo, from 10 a. m. to 1 p. m.
26th—Solar Halo, from 1 to 2 p. m.
28th—Brilliant display of Aurora, from 9 p. m. to 2 a. m. of 29th
29th—Solar Halo, from 5.45 to 7.20 a. m.

The Resultant Direction and Velocity of the Wind for the month of April from 1848 to 1859 inclusive, were respectively N 20° W and 1.90 miles.

April, 1859, was cold and windy; the mean temperature having been 1°47 below the average of the last 20 years.

The depth of rain and snow differed very little from the usual amount.

The Velocity of the Wind was 3 21 miles per hour above the average of the last 12 years, and was absolutely the greatest for any April during that period.

COMPARATIVE TABLE FOR APRIL.

YEAR.	Temperature: M'n.	Temperature: Diff. from Aver.	Temperature: Max ob'd.	Temperature: Min. ob'd.	Temperature: Range	Rain: No. of days	Rain: Inch's.	Snow: No. of days.	Snow: Inch's.	Wind: Resultant Direction.	Wind: Resultant V'y	Wind: Mean Force or Velocity.
	°	°	°	°	°							
1840	42.4	+1 4	65.9	25 3	40 6	14	3 420	2	..		.	......
1841	39 2	—1 8	62 9	22 1	40 8	8	1.370	3		.	..	0 51 lbs.
1842	43.1	+2 1	89 5	21 6	67 9	8	3 740	2		.	...	0.57
1843	40.9	—0 1	70 0	15 1	54 9	7	3 185	3	0 1		.	0 46
1844	47 5	+0 5	74 5	17 2	57 3	10	1 515	1	Inap	.	.	0 34
1845	42.1	+1 1	66 0	14 8	51 2	11	3 290	4	1 6		..	1.00
1846	44.0	+3 0	79 4	24 4	55 0	10	1 300	2	1 3		...	0.55
1847	39 2	1 8	65.6	8 4	57 2	9	2 870	2	4 0	...	..	0.59
1848	41 3	+0 3	65 4	26 5	38 9	5	1 455	1	0.5	N 77° W	1.46	4 89 mls.
1849	39.0	2 0	70 9	23 2	47.7	10	2 655	2	1.7	N 48° W	3 14	7 50
1850	37.9	—3 1	63 2	18.2	45 0	7	4.720	2	1.1	N 39° W	1.12	7 64
1851	41.3	+0.3	59.2	25 8	33 4	11	2.295	3	1.2	N 14° E	2 52	6 07
1852	38 2	—2 8	53 8	19.8	34 0	6	1 900	4	9 4	N 23° E	2 44	6.68
1853	41.9	+0 9	65 7	27 0	38 7	10	2 625	1	1.0	N 12° W	1 90	5 20
1854	41 0	0 0	65 1	22 3	42.8	12	2.686	4	2.7	N 60° E	2 57	6.81
1855	42.4	+1 4	63.8	12 2	51.6	8	3 030	3	1.6	N 36° W	3 99	7.57
1856	42.3	+1.3	89 8	15 1	54.7	15	2.780	3	0 1	N 29° E	1 64	6.06
1857	33.4	—5.6	51 9	10.0	41 9	10	1 776	11	12.9	N 60° W	4 15	10 24
1858	41 5	+0.5	61 5	23 8	37 7	13	1.649	2	0.1	N 14° W	1.64	9 57
1859	39 6	—1 5	62.1	23 9	38 2	9	2.527	8	1 2	N 36° W	2 33	10 79
M	41.00	...	66 31	19 88	46.43	9 2	2.469	3.1	2 36	....	..	7.58 Mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—MAY, 18[illegible].

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Excess of mean above Average
1	29.600	29.860	—	—	40.1	55.6		—	—
2	.818	845	29.900	29.8655	46.2	56.6	46.3	52.33	+ 5.62
3	.866	866	912	.9385	46.3	54.5	47.6	49.62	+ 2.77
4	.876	835	.797	.8377	40.4	62.1	55.0	55.75	+ 8.33
5	.816	.755	715	.7578	51.2	64.9	54.6	56.05	+ 10.85
6	.730	682	690	.6742	53.4	73.1	60.6	64.47	+ 16.43
7	.630	617	.473	.5292	56.6	76.2	62.1	65.92	+ 17.50
8	.446	.520	—	—	56.3	71.2			
9	.461	617	.543	.5112	48.0	46.9	43.3	45.49	— 3.68
10	.566	614	687	.6302	46.2	55.0	47.2	49.55	+ 0.05
11	.726	713	700	.7127	47.2	53.6	50.1	50.75	+ 0.85
12	.760	725	635	.7065	40.8	61.3	54.8	53.67	+ 3.56
13	.860	.740	903	.7916	53.4	69.6	46.2	56.22	+ 5.65
14	.973	956	927	.9492	41.5	55.6	50.5	50.22	0.67
15	.979	.921	—	—	44.7	57.2			
16	.744	636	332	.5140	44.2	58.1	52.3	53.63	+ 2.05
17	.300	.296	317	.3027	52.7	59.6	53.7	55.06	+ 3.07
18	.387	332	.363	.3636	51.9	66.1	60.6	59.07	+ 6.75
19	.517	.694	.743	.6307	50.7	59.8	50.1	53.47	+ 0.85
20	.751	.725	661	.7040	50.5	57.0	51.9	54.00	+ 0.96
21	.614	356	431	.4555	51.2	61.3	53.8	55.15	+ 1.83
22	.[illegible]	479	—	—	48.7	54.8		—	—
23	.707	774	733	.7672	45.1	57.4	51.0	52.10	1.87
24	.767	.765	.707	.7462	49.8	59.9	55.6	56.25	+ 1.95
25	.758	737	.717	.7322	53.2	67.1	60.4	62.27	+ 7.56
26	.700	.655	637	.6142	61.9	69.8	59.2	64.73	+ 9.75
27	.335	294	304	.3092	59.9	63.9	52.3	58.55	+ 3.30
28	.336	509	513	.4622	49.2	63.1	53.4	55.00	0.65
29	.336	.572	—	—	50.1	61.9	—	—	—
30	.967	940	906	.9160	46.6	53.0	45.0	48.50	— 7.75
31	.861	779	736	.7817	47.6	58.3	51.2	51.58	4.97
M.	29.6790	29.6570	29.6467	29.6596	50.37	60.70	52.73	55.10	+ 3.62

Day.	Tens. of Vapour 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N
1	.204	.169		—	58	37	-	—
2	.177	.148	.159	.158	58	32	46	40
3	.149	.171	.149	.156	44	40	43	44
4	.182	.306	.300	.206	51	54	60	59
5	.318	.322	.318	.321	85	45	79	67
6	.321	.444	.406	.385	79	50	76	65
7	.389	.416	.513	.434	85	46	92	71
8	.349	.354	—	-	77	44	—	—
9	.285	.279	.232	.263	85	74	90	86
10	.165	.185	.174	.182	63	42	52	51
11	.210	.260	.292	.263	64	65	80	70
12	.297	.301	.317	.330	95	72	80	79
13	.375	.375	.150	.278	92	52	48	58
14	.180	.209	.132	.158	60	48	41	49
15	.171	.218	—		57	43	—	-
16	.195	.207	.357	.291	63	60	91	70
17	.363	.409	.331	.377	91	40	88	87
18	.341	.430	.435	.421	98	91	86	89
19	.304	.364	.221	.297	82	72	61	71
20	.344	.328	.299	.294	66	70	77	70
21	.332	.445	.320	.370	88	82	79	75
22	.308	.332			78	53		—
23	.202	.258	.200	.245	.67	54	69	63
24	.276	.280	.235	.280	77	.64	57	62
25	.330	.394	.403	.344	73	59	74	69
26	.449	.502	.366	.406	88	60	72	73
27	.497	.369	.379	.392	96	61	96	81
28	.334	.345	.391	.301	95	43	93	72
29	.334	.339		—	92	61		—
30	.211	.125	.146	.100	86	30	47	45
31	.214	.253	.305	.263	64	64	81	69
M.	.294	.315	.298	.300	.78	.58	73	.67

Day.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't. Direction	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result'.	M'N	Rain in inches.	Snow in inches.
1	N E b E	E b S	N E b E	N 86 E	4.3	6.5	2.5	4.44	4.77		...
2	Calm.	E S E	E N E	N 82 E	0.0	8.2	5.8	7.02	7.50		...
3	E N E	E	N E b E	N 76 E	9.0	11.2	3.8	9.21	9.37		...
4	E b N	E b S	E N E	N 83 E	8.6	7.0	2.2	3.88	5.05	inap	...
5	S W b S	E	E	S 54 E	2.2	7.2	0.2	2.29	3.22		...
6	E	S b E	Calm	S 46 E	1.5	4.0	0.0	1.81	2.37		...
7	N N W	S	Calm	S 29 W	1.6	11.2	0.0	3.47	4.52		...
8	Calm	S W b S	W b N	N 35 W	0.0	8.0	4.0	2.13	5.13	0.215	...
9	E	E b N	E	N 58 E	9.7	7.8	3.3	5.01	5.83	0.585	...
10	N b E	E S E	E S E	N 78 E	9.8	10.0	3.5	6.52	7.50		...
11	N E b E	E b N	E b N	N 85 E	0.2	12.0	4.8	8.16	8.22		...
12	E	E	E b N	S 84 E	3.4	9.0	5.2	4.92	4.96		...
13	Calm.	N N W	N W b N	N 30 W	0.0	8.0	3.0	7.38	0.36		...
14	N N W	S	N N W	N 29 E	6.5	8.8	0.2	0.90	5.31		...
15	N b W	S b W	S b W	S 15 E	1.3	7.5	5.5	1.55	5.30		...
16	N E	N E b E	S b E	S 63 E	7.5	7.5	2.8	3.67	6.65	0.946	...
17	S b W	E b S	N E	S 77 E	6.8	4.3	0.8	2.64	3.65		...
18	N E	E b S	N b W	N 39 E	2.9	10.5	6.0	3.75	7.25		...
19	N b W	S b E	N	S 8 W	10.5	3.0	6.8	4.03	4.84		...
20	S b W	E b S	E N E	N 80 E	1.8	5.4	1.5	4.17	4.28		...
21	E b N	E b S	W N W	N 02 W	1.4	2.0	4.6	1.61	2.78	0.595	...
22	N W	N W	N b W	N 53 W	3.2	14.0	5.5	6.04	7.35	0.035	...
23	Calm	S E b S	Calm.	S 26 E	0.0	6.0	0.0	2.43	2.63		...
24	Calm	S b E	E N E	S 89 E	0.0	7.2	0.3	2.70	2.57		...
25	E N E	E	E b S	S 88 E	0.5	5.4	0.4	1.64	2.70	0.030	...
26	N N W	S E b S	Calm.	S 63 E	9.0	4.0	0.0	0.21	2.05	0.033	...
27	E b S	S S W	S W b S	S 39 W	1.2	22.0	17.6	11.69	13.16	0.215	...
28	S W b W	N W b W	S W b S	S 79 W	10.0	15.8	4.2	6.64	8.63	0.735	...
29	S W b W	W b N	N b W	N 43 W	5.2	13.5	6.5	7.36	8.92	inap	...
30	N E b N	E	E	N 83 E	1.0	2.4	0.4	3.67	3.96		...
31	E N E	E N E	E b N	N 68 E	10.0	6.5	1.0	6.09	6.37		...
M.	......	......	......		4.35	8.95	3.87		5.70	3.410	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR MAY, 1859.

Highest Barometer . . . . 29.986 at 8 a. m. on 14th, } Monthly range=
Lowest Barometer . . . . 29.224 at 2 p. m. on 27th, } 0.762 inches.

Self-registering Ther.:
- Maximum temperature . . . . 79°6 on p.m. of 8th } Monthly range=
- Minimum temperature . . . . 39°5 on a. m. of 11th } 40°1
- Mean maximum temperature . 63°40 } Mean daily range = 16°26.
- Mean minimum temperature . . 47°13 }
- Greatest daily range . . . . . 25°4 from a. m. to p. m. of 8th.
- Least daily range . . . . 4 4 from a. m. to p. m. of 9th.

Warmest day . . 7th ... Mean Temperature . . . 65°92 } Difference = 20°44.
Coldest day . . . . 9th . Mean Temperature . . . 45°48 }

Maximum { Solar . . . . 90°8 on p. m. of 8th } Monthly range=
Radiation { Terrestrial . . . . 27 6 on a. m. of 23rd } 63°2.

Aurora observed on 4 nights, viz. : 10th, 19th, 22nd, and 24th; possible to see Aurora on 22 nights; impossible on 9 nights.

Raining on 11 days; depth, 3.410 inches; duration of fall, 50.6 hours.
Mean of cloudiness=0.41; most cloudy hour observed, 6 a. m., mean=0.49: least cloudy hour observed, 10 p. m., mean=0.27.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1269.87	906.32	2030.40	966.90

Resultant direction, N 72° E; Resultant Velocity, 1.59 miles per hour.
Mean velocity of the wind 5.70 miles per hour.
Maximum velocity . . . 24.8 miles per hour, from 2 to 3 p.m. on 27th.
Most windy day . . . . 27th—Mean velocity, 13.16 miles per hour.
Least windy day . . . . 26th—Mean velocity, 2.05 do
Most windy hour, noon to 1 p. m.- Mean velocity, 8.96 do } Difference
Least windy hour, 11 p. m., midnight—Mean velocity, 3.48 do } 5.48 miles.

4th. Perfect solar halo from 7 a. m. to 2 p. m.
8th. Thunderstorm, with heavy rain, from 4 to 5 p. m.
9th. Hoar frost at 5 a. m.
11th. Lunar corona from 8 p. m. to midnight.
13th. Lunar halo from 9 to 11 p. m.—very perfect.
14th. Solar halo from 7 to 8 a. m.
16th. Thunderstorm from 1 to 4 a. m., dense fog from 4 p. m. to midnight, and lunar corona at 11.50 p. m.
17th. Solar halo with brilliant colors at 2 p. m., and sheet lightning from 9 p. m.
18th. Thunderstorm from 2.15 to 4 p. m.
21st. Shower of hail and rain at 10.30 a. m.
22nd. Hoar frost at 6 a. m.
23rd.
25th. Sheet lightning round the horizon from 9 p. m.
26th Thunderstorm from 5.40 to 6 a. m.
27th. Thunderstorm from 5.55 to 6.20 a. m.
29th. Sheet lightning in S W. at 11 p. m.

The mean temperature of May, 1859, was 3°78 above the average of 20 years, and it was the warmest May but one (1846) during that period.

The Resultant Direction and Velocity of the Wind for the month of May, from 1848 to 1859 inclusive, were respectively N. 4° E., and 1.34 miles.

COMPARATIVE TABLE FOR MAY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction	Resultant Velocity.	Mean Velocity
1840	53.8°	+ 2.4°	74.5°	30.8°	43.7°	9	4.150		not recorded.	°		
1841	50.3	— 0.9	76.2	26.6	49.6	11	2.350	1		...	..	0.35 lbs
1842	49.1	— 2.3	74.3	30.0	44.3	7	1.275	.			.	0.53 "
1843	49.1	— 2.3	79.6	28.9	50.7	3	1.570	.	.	.	.	0.52 "
1844	53.6	+ 2.2	77.7	29.0	48.7	14	5.670		...	...		0.30 "
1845	49.6	— 1.8	70.6	29.4	47.2	8	2.300	.	...	...	..	0.35 "
1846	55.5	+ 4.1	78.1	34.3	43.8	9	4.375	..	..	...	...	0.46 "
1847	54.4	+ 3.0	72.6	27.8	44.7	12	2.040		..	...	.	0.29 "
1848	54.1	+ 2.7	78.5	31.9	46.6	13	2.520	..		N 40 W	1.51	4.93 ms.
1849	48.0	— 3.4	72.5	32.7	39.8	16	5.116	..	...	N 51 E	1.97	5.33 "
1850	47.6	- 3.8	76.3	31.1	45.2	7	0.645	1	Inap.	N 64 W	2.05	6.32 "
1851	51.3	— 0.1	73.2	28.7	44.5	12	2.956	1	0.5	N 32 W	1.58	6.34 "
1852	51.4	0.0	73.3	34.5	38.8	7	1.123	1	Inap.	S 82 W	0.99	4.00 "
1853	50.9	— 0.5	78.4	38.4	40.0	17	4.420	1	Inap.	N 2 W	0.83	5.16 "
1854	52.2	+ 0.8	80.0	27.6	41.4	11	4.630	...	...	E	0.40	5.38 "
1855	53.1	+ 1.7	74.8	33.9	40.9	6	3.663	2	0.9	N 1 W	2.76	5.93 "
1856	50.5	— 0.9	80.1	35.5	44.6	14	4.580	1	Inap.	N 4 E	3.99	9.81 "
1857	48.9	— 2.5	72.5	27.9	44.6	15	4.145	1	Inap.	N 23 W	1.14	8.13 "
1858	48.9	— 2.5	66.0	35.0	31.0	17	6.867	...	...	N 42 E	3.39	9.30 "
1859	55.2	+ 3.8	76.2	41.5	34.7	11	3.410		...	N 72 E	1.59	5.70 "
Mean	51.39	..	75.08	31.78	43.24	11.6	3.506	0.5	0.08	...	...	6.36

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—FEBRUARY, 1859.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LLD.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	Tension of Vapour. 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour. 6 A.M.	2 P.M.	10 P.M.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	30.028	30.020	30.091	8.2	24.9	10.1	.048	085	054	77	67	76	s w	N by E	N N E	0 15	0 22	0.78		Inap	Snow	Cirr Str. 6	Clear, ft Au.B
2	.080	.006	029	—8.4	10.0	—4.3	021	034	024	62	78	65	N by E	N by S	N E	2 98	1 33	0 81	.	.	Clear	Clear	Do. Zo. L v.B.
3	29.825	29 719	29 600	—4.1	18.6	9.0	027	063	037	70	81	88	N E b E	N E b E	N E b E	21 27	19 26	20.20		4 30	Snow.	Snow	Snow
4	.491	597	786	8.9	26.2	20 1	057	117	191	89	82	85	N E b E	W S W	S by W	20 20	2 28	0 21	.	3 00	Do.	Cirr Str. 0.	Cirr Str. 10
5	909	30 025	30 233	10.8	19.8	16 3	048	091	.074	70	77	85	W S W	S W	W S W	1 85	3 03	3 82	.		Clear.	Do. 2.	Do 10.
6	30.088	.034	092	15 0	18 9	6 7	.074	077	040	85	76	87	N N E	N E b E	N W b E	0.86	6 52	0 12		1 72	Snow.	Snow	Cir., ft Au Bo.
7	.174	.234	207	—5.1	29 3	1 0	042	045	034	76	62	71	W	S by E	E		...				Clear	Clear.	Do.
8	.076	29 930	29 987	—4.2	20 0	23 0	020	045	106	80	78	86	N N E	N E b E	S E by S	2 77	0.43	0.03			Do.	Cirr St. 0	Do
9	29.654	.501	500	31.4	37 8	31 2	090	196	16	78	86	95	S by E	S E b S	W by S	0.36		..		3.0	Cir. Str. 10	Snow.	Cirr. Str 10.
10	.773	779	30 066	1 0	6 9	—4 1	.034	045	028	71	.68	80	W N W	W S W	S W	13.16	4 57	7.71		.	Clear.	Clear.	Clear.
11	30.143	30 480	213	18 7	13 6	0 5	013	037	036	61	72	84	S S W	S S W	S W	0 01	0 01	0.01	..	.	Do.	Do.	Cirr 10 L Ha.
12	.127	025	.161	—10 0	26 0	—5 5	015	105	031	58	75	80	S W	S S W	E	.			..	.	Str. 2.	Do.	Clear.
13	.141	30 000	29 894	—23.2	22 2	0 1	010	084	051	50	71	75	S S W	S	S by E			0 13	..		Clear.	Do.	Lt. Cirr. L. Ha.
14	29.874	29.787	881	10.0	20 1	14 3	054	123	0.7	78	77	81	S W	W by N	S S W	3 97	11 40	2 00			Cir. Str 10.	Do	Str. 4.
15	.776	639	541	15.2	22.2	24.2	085	096	115	74	79	88	N E b E	N E b E	E	0 11	0 16	0 21		0 40	Do. 9	Snow.	Cirr. Str 10.
16	.070	29 737	971	33.4	39 3	24.1	156	188	105	85	77	80	W S W	W S W	N	3 07	3 08	8 25	Inap		Do. 9	Cirr. Str. 8.	Clear.
17	30.154	30 140	30 025	15.1	33 5	10 9	083	160	091	81	79	85	S by N	N E b E	N E b E	..		4.56			Clear.	Do. 6.	Cirr. Str. 4.
18	29.814	29 791	29 917	30.4	43.0	37.0	148	237	201	89	87	96	S S E	S W b W	S S W	13.76	2 31	2.17		1 30	Snow.	Do 8	Do. 4.
19	29.934	827	664	17.6	44.9	33.1	078	203	20-	85	80	00	S	N E	E S E	0 66	0 76	5.10			Clear.	Cirr Str. 3.	Do. 10.
20	.179	29 872	010	35 7	43 0	32.3	183	201	156	90	96	89	S E b E	S S W	W S W	7 85	6 32	20.70	0 512	Inap.	R'n, with thu	Cirr Str. 10.	Clear
21	.347	29.471	.734	10.1	15 0	14.0	039	055	067	57	64	81	W by S	W S W	W	42.90	20 47	21 06	...	- -	C Str. 8	Do. 0	Cirr. Str 6.
22	.853	981	29 894	13.5	21.4	12.0	072	085	057	91	78	74	S W	S W	E N E	20.21	2 06	9 63	.		Clear	Clear	Clear Au Bo
23	.878	797	.784	8 9	27 0	25 0	051	117	105	77	82	80	N E b E	N E b E	S S E	1 22	3 10	...	.		C Str. 3.	Cirr Str. 10	Cirr Str. 10.
24	.764	850	30 248	18.1	27 0	10 1	100	111	057	74	75	70	W by S	N N W	N N W	0 03	5.47	14.33	.	.	Jo. 3.	Jo. 8.	Clear, Au. Bo.
25	.335	30 260	227	—6 7	14 1	4 7	021	057	043	62	72	76	N N E	E	N E	0.05	4 62	1.08			Clear.	Clear.	Do. do.
26	30.000	29 703	29 681	6 6	11 0	21 8	021	362	101	64	80	86	N N E	N E b E	S S E	12.70	13 57	10.75		8.60	Do.	Snow.	Cirr. Str 10.
27	29.779	615	557	10.4	39 0	30.1	048	310	148	69	91	89	S S E	S S E	S W	2 86	1.73	0 15	..	.	Do.	Cirr. Str. 9.	Snow.
28	.500	697	794	27 8	29 0	10 1	128	117	065	82	76	74	W by S	W	W S W	0 29	15 43	0 72	..	1 10	Snow.	Do. 9.	Cirr. Str 9.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MARCH, 1859.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea 118 feet.

Day.	Barom. corrected and reduced to 32° 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	Tension of Vapour 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	Direction of Wind 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour. 6 A.M.	2 P.M.	10 P.M.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10, A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	30 161	30.166	30 816	7.8	7 9	0.8	.020	.034	.036	.70	.54	.84	w by s	w	s w b w	19.90	11.55	1 23	.		Clear	Clear.	Clear, Au. Bo.
2	492	.482	414	- 18.7	23.0	0 0	.013	.069	.036	.69	.72	.84	s s w	s	s	19.20	0.56	2.32			Do.	Do	Do. do.
3	234	29 931	29 772	10 6	17.1	21.0	.021	.064	102	.77	.75	.92	N E	N E b E	s E	0.31	7.37	11.67			Do	Cirr. Str 10	Snow.
4	29 364	.250	315	21.7	33.0	29.6	.090	.168	.154	78	.89	.94	E S E	s s E	N E b E	17 70	3.52	1.75	.	5.50	Snow	Snow	Cirr Str. 10.
5	29 354	418	657	26 2	40.6	34.5	.123	.188	169	.87	77	.84	N E b s E	E s E	w by s	11.83	6.31	12.16		Inap.	Cirr. Str. 10.	Cirr. Str. 10	Do 10.
6	950	30 102	30 114	30 6	33.1	33.0	142	.177	.156	.84	.85	.83	w	w	w s w	10.98	5 40	8.08		.	Do. 9.	Do 8	Do. 10
7	30 047	29 932	29 975	27.9	38.6	19.0	.123	.186	.087	.82	.81	.84	N E b E	N E b E	N E	3.60	3.32	3.40	..		Do. 10.	Str. 2	Clear.
8	29.559	560	669	18 7	31.5	24.2	.077	149	105	76	.84	.80	N E b E	N E	N E	24.21	21 95	12.82		.	Do. 10.	Cirr. Str. 8	Do. Aur. Bor.
9	780	874	.950	12 4	42.9	23.1	154	.216	103	.71	.79	.85	w by s	s w b s	N w b w	5 47	2.46	0.31			Clear	Clear.	Clear.
10	30 033	921	30 065	11 2	40.1	26.7	.057	.290	.117	79	.82	.82	s by w	s E b s	s E	0.94	0.37	0.27	.		Do.	Do.	Cirr Cum, 4
11	.014	972	29 842	21 4	46.5	38.1	.090	.251	.208	.78	.81	.91	N N E	N N E	s E b s	4.30	5.33	10.16		.	Do.	Do	Cirr. Str 10.
12	29.617	742	806	40 1	47.5	41.6	.225	.291	.228	.91	.89	.87	s E b s	s	w s w	19.73	14.40	4.76	0.262		Rain,	Cirr Str. 10.	Do 8.
13	860	994	30 110	36 7	47.0	38.6	.184	.283	164	.85	.85	.85	s	w s w	s w	13.42	14.26	3.80	.	..	Cirr Str 4.	Str. 2.	Do. 8.
14	30 152	994	29 879	24 2	44.5	39.7	.109	.231	.210	.83	.80	.86	E by s	N E b E	N E b E	0.50	3.20	5.75		.	Do 4.	Cirr. Str 6.	Do. 10.
15	29 458	439	476	38 2	45.0	37.0	.201	.248	.199	.87	.88	.89	s E	s E b E	s w	13.00	9.60	5 40	0.230	.	Rain	Cirr Str 10.	Do. 9.
16	.600	819	.990	32 0	36.1	34.1	.149	.170	.162	.84	.60	.84	w s w	w by s	s w	2.22	20.38	29.45	.	.	Cirr. Str 9.	Do. 4.	Clear.
17	999	.987	.911	29 4	46 3	37.4	.136	.285	193	.85	.84	.86	s s w	s E b s	s E b s	5 78	0 77	0.01			Clear.	Cirr Str. 8.	Cirr. Str. 10.
18	650	294	194	36 8	44.7	37.7	154	.258	.196	.88	.69	.89	E	N E b E	N E	2.93	8.64	3.37	0.217		Cirr Str 10.	Rain.	Do. 10
19	29.620	635	078	42 8	46.1	22.6	137	.296	.064	.87	.93	71	s w	s by E	w b s	11.07	6.88	19.72	0.346	Inap.	Rain	Cirr. Str 8.	Do 6?
20	29.317	29.525	759	19 8	27.8	26.3	.087	111	117	.84	78	.82	w by N	w by N	w by N	29.98	32.22	16.60	.	..	Cirr. Str. 8.	Do. 9.	Clear
21	924	29 932	998	19.7	40.1	30.4	.081	.203	.142	77	.82	.84	w by N	s w	s s E	20.20	11.60	0.87	..		Clear.	Cirr. Str. 2	Do, Aur. Bor.
22	907	.850	.700	25 5	34.2	30.1	.111	.155	.148	.81	.78	.89	N E b E	N N E	N N E	2.45	10.23	10.43		2.90	Str. 4.	Snow	Cirr. Str. 10.
23	752	798	946	28.2	44.0	36.3	.129	.241	.170	.84	.85	.80	s w b w	w s w	s s w	4.16	8.47	2.28		.	Cirr. Str. 10.	Cirr Str. 4.	Clear.
24	.771	567	.516	26 7	54.4	38 7	123	.169	.223	.97	.84	.93	N E b E	E N E	E N E	3.22	6.62	8.47	0.610	.	Do. 10.	Rain.	Cirr. Str. 9.
25	.437	421	547	34.0	52.1	36.6	182	.270	121	.93	72	.89	N E b E	s w b w	s by w	11.33	3.51	2.13	0.230		Rain.	Cirr Str. 4.	Do 9.
26	.590	.544	29.624	33 2	37.0	32.0	.103	.176	.162	.90	.81	.89	s w b w	s w b w	s w b w	1.46	7.65	2.22	..	Inap	Cirr. Str. 8.	Do 6.	Do, 4.
27	.694	.507	.66	25 2	38.2	32.5	.105	.168	140	.80	.81	.84	w s w	w by E	s w	24.22	0.97	12.59		...	Clear.	Cirr. 3.	Clear, Au. Bo.
28	.751	671	.600	27 4	40.9	34.3	.129	.175	.155	.92	.69	.79	E N E	N E b E	N E b E	0.46	4.08	9 76	..	.	Do	Cirr. Str. 6.	Do.
29	.797	200	.144	34 2	50.1	40.2	.162	.300	.218	.84	.85	.87	N E b E	s E	s w	8.84	2.73	13.80	0.570	.	Cirr. Str. 8.	Rain.	Cirr. Str. 9.
30	.8[illegible]0	.467	580	43 1	40.0	34.1	.158	167	.156	.85	.68	.79	s w b s	w s w	w s w	23.90	16.61	14.63		.	Do. 8.	Cirr. Str. 2.	Str. 2. Au. Bo.
31	.834	.514	.760	39 1	38.5	[illegible]	.130	.180	.136	.76	.77	.83	w s w	w	w	9.67	16.08	20.14	Inap.	...	Do. 4.	Do. 8.	Cir. ft. Au. Bo.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR FEBRUARY, 1859.

Barometer	Highest. the 11th day	30.460
	Lowest, the 20th day	28.872
	Monthly Mean	29.857
	Monthly Range	1.588
Thermometer...	Highest, the 20th day	43°.1
	Lowest, the 13th day	-23°.6
	Monthly Mean	15°.62
	Monthly Range	66°.7

Greatest Intensity of the Sun's Rays .... 58°.7
Lowest point of Terrestrial Radiation .... -23°.9
Mean of Humidity .... .776
Rain fell on 2 days, amounting to 0.512 inches; it was raining 9 hours and 15 minutes, and was accompanied by thunder on 1 day.
Snow fell on 10 days, amounting to 23.55 inches; it was snowing 92 hours 45 minutes.
The most prevalent wind was N. E. by E.
The least prevalent wind was N.
The most windy day was the 21st; mean miles per hour 28.14.
The least windy day the 12th; mean 0.00.
Aurora Borealis visible on 5 nights.
Lunar Halo visible on 2 nights.
Zodical Light very bright.
The electrical state of the atmosphere has indicated moderate intensity.
Ozone was present in moderate quantity.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MARCH, 1859.

Barometer	Highest, the 2nd day	30.492
	Lowest, the 19th day	28.620
	Monthly Mean	29.686
	Monthly Range	1.872
Thermometer...	Highest, the 24th day	47°.5
	Lowest the 3rd day	-11°.6
	Monthly Mean	30°.93
	Monthly Range	59°.01

Greatest Intensity of the Sun's Rays .... 77°.6
Lowest point of Terrestrial Radiation .... -11°.9
Mean of Humidity .... .823
Rain fell on 8 days, amounting to 2.498 inches; it was raining 59 hours and 50 minutes.
Snow fell on 4 days, amounting to 8.40 inches; it was snowing 11 hours and 45 minutes.
The most prevalent wind was N. E. by E.
The least prevalent wind was E.
The most windy day was the 20th; mean miles per hour 26.26.
The least windy day was the 10th; mean miles per hour 0.32.
Aurora Borealis visible on 7 nights.
The electrical state of the atmosphere has indicated very high tension.
Ozone was present in large quantity.
Woodpecker seen on 1st day.
Crows first seen on 8th day.
Song Sparrow first heard on 14th day.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—APRIL, 1859.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL. D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° Fahr.			Temp. of the Air.			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10, A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	29.900	29.870	30.030	20.7	37.0	30.2	111	104	130	81	76	78	W N W	W N W	W N W	19.72	21.70	18.83		Inp.		C. St. 8.	C. St. 2.	Clear ft. Au. Bor.
2	30.020	.942	29.024	23.0	41.1	42.5	099	107	137	74	78	76	W b N	W b N	S	5.57	6.90	0.57		0.630		Clear	Do. 4.	D do. do
3	29.350	.230	341	33.2	40.0	34.1	164	203	182	95	92	.95	NE b E	NE b E	W	5.72	9.36	11.14		0.030		C. St. 10	Do. 8.	Rain
4	217	.260	414	32.1	32.5	27.0	162	143	117	80	79	82	W	W N W	W N W	14.81	21.86	12.27				Do. 8.	Do. 8.	C. St. 4.
5	428	402	479	21.0	32.0	27.2	082	143	117	72	99	82	N W	W	W N W	22.92	49.80	19.70				Do. 4.	Cirr. 2.	Clear.
6	.554	550	697	21.0	35.4	28.2	098	186	135	85	81	88	W b N	W	W b W	19.50	13.00	18.20				Do. 6.	C. St. 4.	Do. Aur. Bor.
7	.695	564	672	23.0	40.6	35.0	090	203	169	74	82	84	W S W	W	W S W	7.60	9.08	5.18				Lgt. Cr. 2	Clear.	C. St. 4.
8	750	746	29.910	31.6	41.0	29.0	136	190	129	70	74	82	N	W	N b W	3.85	9.05	12.20				Do. 4.	Do.	Clear ft. Au. Bor.
9	30.118	30.052	30.100	19.1	40.5	29.0	077	269	129	78	88	82	W N W	W N W	N b W	18.77	16.90	10.57				Clear	Do.	Do. do do.
10	157	29.974	.012	13.1	45.6	32.0	072	251	149	75	84	84	N E	S b E	NE b E	4.22	1.35	1.06				Do.	Do.	C. C. St. 8.
11	29.830	716	29.674	29.1	34.4	33.1	123	169	168	77	84	89	NE b E	S E	E b S	8.03	9.80	9.50		0.66	3.00	C. C. St. 9.	Snow	Snow.
12	.700	733	096	34.2	39.4	36.7	175	195	206	89	82	95	E b S	NE b E	N W	6.51	0.09	0.42		0.214		C. St. 10	C. St. 8.	C. C. St. 6
13	951	927	30.040	30.0	46.5	37.0	190	280	184	93	88	85	W b N	W b S	NE b E	1.28	0.92	5.71				Clear	Do. 9.	C. St. 3.
14	.934	640	29.527	32.0	40.0	34.0	162	208	182	89	92	95	NE b E	S E b E	S E b E	15.54	11.16	10.43		0.214	0.37	C. C. St. 8.	Rain.	Rain.
15	500	601	307	33.0	45.0	41.0	208	234	241	91	80	95	S W b S	S E b S	S b W	16.42	4.22	7.05		0.550		Do. 6	C. St. 9.	Do.
16	551	347	641	35.1	49.6	36.2	190	279	180	95	81	88	W S W	W S W	W S W	8.30	4.46	15.42		0.563	Inp.	Sleet.	C. C. St. 4.	Clear.
17	.640	700	851	32.1	40.0	38.6	170	258	186	98	74	81	W	W S W	N b W	7.22	8.83	0.01				C. St. 8.	C. St. 6.	C. St. 4
18	857	.879	914	38.9	49.5	38.0	169	253	151	84	74	67	N N E	W S W	N W	5.65	5.73	2.07				Clear	Clear.	Clear.
19	817	861	711	28.2	54.4	43.0	105	185	106	70	40	39	S W	N N W	N N W	1.05	4.71	11.60				Do.	C. St. 4.	Do
20	760	.600	714	34.2	53.8	40.2	175	177	145	80	45	60	W b N	W N W	N b W	7.08	11.22	13.40				C. Cirr. 4.	Clear.	Do.
21	.753	621	749	30.0	61.6	39.0	.130	296	195	78	53	82	S b W	S W	N b W	4.30	2.22	6.66				Clear.	C. St. 2.	Do. Aur. Bor.
22	748	.670	.065	34.2	53.0	43.2	156	172	221	79	52	82	NE b E	NE b E	NE b E	7.76	5.97	2.40				C. C. St. 4.	C. St. 6.	C. St. 10.
23	.497	171	.030	35.4	40.4	37.9	.183	203	206	90	82	92	NE b E	NE b E	NE b E	12.09	32.85	21.00		2.221	Inp.	C. St. 10.	Rain.	Rain.
24	29.928	28.999	414	37.6	44.3	38.7	214	198	196	95	68	86	S S W	W S W	W b S	20.00	8.00	0.00				Do. 10.	C. St. 8.	C. St. 2.
25	714	29.797	842	36.0	54.0	43.1	.177	237	222	85	58	85	W b S	S S W	S E	0.00	4.14	7.90				Clear.	Clear.	Cirr. St. 6.
26	774	652	.676	43.0	64.2	45.0	231	446	275	83	77	92	S b E	S b E	S S E	1.50	8.80	5.60				Do.	Cirr. Cir. 4.	C. St. 2.
27	.900	908	970	30.0	47.7	36.2	146	225	174	90	70	78	N b W	W	W b S	12.85	9.11	0.96				Do.	Clear.	Clear ft. Au. Bor
28	30.100	30.005	30.007	35.0	63.0	39.1	.142	327	105	70	57	82	W N W	S b W	S b W	3.53	0.71	0.90				Do.	Do.	Do.
29	000	29.802	29.840	44.0	70.3	54.6	241	436	308	84	49	.74	S W b S	S W	W S W	1.85	5.87	1.90				Do.	Do.	Do. ft. Aur. Bor.
30	29.937	.900	.980	41.1	69.1	45.6	.212	529	246	82	75	80	E b S	E b S	N	4.52	0.56	12.47				Do.	Do.	Do.

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—MAY, 1859.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air			Tension of Vapor.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Mean direction of Wind	Rain in inches.	Snow in inches.	Weather, &c. A cloudy sky is represented by 10, A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.				6 A.M.	2 P.M.	10 P.M.
1	30 096	29 948	29 915	42 2	66 3	52 2	222	346	308	83	64	79	w b s	w b s	s	3 45	2 61	5 36			.	Clear	Clear	Clear.
2	084	30 044	30 145	42 1	61 7	47 0	212	290	232	82	53	73	N E b N	N W	N	7 55	10 22	3 73		..		Do.	Do.	Clear, ft. Au. B.
3	187	102	170	39 1	69 1	50 2	186	398	258	81	56	71	N E	W s W	s W	6 41	3 13	0 86	...	..	..	Do.	Do.	Do.
4	135	064	059	37 0	79 3	60 3	189	362	262	56	36	51	s E b s	s b E	s s E	0 01	0 47	0 33				Do.	Do.	Do.
5	29 983	29 990	29 841	43 7	76 1	66 5	275	470	484	92	52	72	s	s W	s W	0 00	0 82	0 00		Inp		Hazy.	Hazy.	C St. 9.
6	810	827	840	66 0	82 0	70 6	353	341	440	56	50	61	s s W	s s W	s W	0 00	0 17	3 45				Clear	Cir. St. 4	Clear.
7	740	646	040	63 0	83 0	73 1	412	604	520	75	64	55	s w	s w b w	s w b w	8 05	7 90	0 36				Do.	Hazy	Hazy
8	.634	583	067	56 0	65 1	44 0	370	337	216	84	55	[illegible]	N E b E	N E b E	N E b E	5 20	12 81	12 50				C St 3.	Cir St 8	Rain.
9	.734	699	070	30 7	64 2	44 0	135	405	211	82	67	72	N E b E	N E	N N E	9 30	21 16	0 52		0 400		Do. 8.	Do. 6.	Cir. C. 4.
10	.797	786	885	35 5	74 2	49 6	162	680	225	80	50	85	N b E	N b E	N b E	0 37	2 18	1 60				Clear	Clear.	Clear.
11	.969	952	997	43 0	72 1	55 2	215	286	321	70	36	74	N b E	s s E	s E	1 52	7 57	13 87				Do.	Do.	C. St. 4.
12	989	.992	897	51 4	76 2	62 7	203	336	399	55	37	72	s s E	s E	s E	11 30	6 60	4 72				C C. St. 10.	Cir. 2.	C. C 4 Lr. H.
13	830	750	879	58 0	78 5	67 1	394	554	499	52	58	75	s s E	W s W	W b s	2 34	5 20	11 65				Do 8.	Cir. St. 10.	Clear.
14	30 107	30 100	30 075	43 0	65 0	50 5	189	241	240	64	57	68	N b E	s E b s	s E	10 87	8 26	0 67				Clear.	Clear.	Cir Str. 4.
15	081	062	040	44 2	70 3	53 1	218	293	237	70	40	66	s s b E	s	s E b s	0 88	3 33	1 87				[illegible]r Str 2.	Do.	Clear.
16	29 994	29 762	29 732	44 7	77 4	60 4	241	389	225	54	42	48	s b E	s s E	s s E	0 07	1 35	12 20				Clear.	Do.	C St. 10.
17	865	620	644	44 1	49 5	61 0	238	452	354	88	92	96	s s E	s E b s	s E b s	19 60	0 81	5 26		0 703		Rain.	Rain.	Do. 8.
18	645	517	644	54 2	79 0	61 1	569	581	419	90	60	80	s s E	s E	s E b E	0 98	0 32	13 35				Cir Str. 8.	C 2.	Str. 4.
19	.637	821	936	59 3	50 4	40 0	469	328	363	94	88	89	s E b s	N b E	s s E	0 17	18 25	1 97		0 226		Rain.	Rain.	Clr 4 Au. Br.
20	991	969	994	44 0	62 5	56 0	248	363	370	88	64	84	N E b E	E b N	s E	7 71	11 07	0 42				Cir Str. 10.	Cir Str. 8.	Clear
21	957	642	612	54 6	74 1	59 0	362	568	413	87	67	70	E b N	s E b s	s E b s	3 86	15 73	1 91				Cirr C St 6.	Do. 6.	C St 8.
22	.517	880	630	58 0	66 6	52 1	429	319	[illegible]	91	62	79	s W	s W	s s W	22 93	4 31	6 78		0 120		Rain	Do. 6.	Cir C St. 6.
23	896	800	877	49 0	64 7	55 5	253	314	321	74	53	74	s W	s W	s W	10 22	10 31	12 43		...	.	Clear.	Clear.	Clear
24	981	914	883	54 4	82 0	62 0	528	738	360	77	69	74	s W	s b E	s b E	1 07	3 93	0 00		..	..	Do.	Do.	Do.
25	975	996	901	60 5	89 2	67 0	396	598	425	76	43	64	s E b s	s E	s E	0 18	4 32	4 37		..		Do.	Cir. St. 4.	Str. 2.
26	981	800	885	63 7	91 9	64 3	478	687	612	83	47	96	s s E	s b W	s W	0 61	1 80	2 77		0 435	...	Do.	Clear	C St. 6 lb. & l.
27	.874	504	401	66 4	80 0	64 5	538	677	527	92	60	86	s w b s	s W	W N W	0 06	6 75	9 77		0 583		Fog	Cir. St. 9.	Rain
28	.425	517	650	60 2	62 2	53 0	359	429	354	73	77	90	w b s	W s W	W s W	4 35	12 05	18 86		0 260		Cir C. Str. 6.	Do. 10.	Cir. 4.
29	836	.687	674	49 0	62 8	40 0	297	453	304	83	80	89	s b E	W s W	N b W	3 42	5 97	8 78	...	0 803		Rain.	C. Cir. St. 4.	C Str. 10.
30	30 000	993	30 09[illegible]	42 5	64 1	61 1	222	529	270	83	89	79	N W	W s W	s s W	6 45	5 30	8 16		...	.	Clear, frost.	Clear.	Clear.
31	041	917	29 886	51 0	78 0	59 9	362	416	352	83	38	70	s s E	s s E	s s E	0 15	1 61	1 87	...	...	...	Do. do.	Cir. 6.	C. St. 9.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR APRIL, 1859.

Barometer	Highest, the 9th day	30.160
	Lowest, the 24th day	28.928
	Monthly Mean	29.638
	Monthly Range	1.232
Thermometer	Highest, the 29th day	76°3
	Lowest, the 10th day	16°1
	Monthly Mean	38°63
	Monthly Range	60°2
Greatest Intensity of the Sun's Rays		82°3
Lowest point of Terrestrial Radiation		26°0
Mean of Humidity		.792

Rain fell on 9 days, amounting to 4.422 inches; it was raining 41 hours and 48 minutes.
Snow fell on 4 days amounting to 3.97 inches; it was snowing 18 hours and 15 minutes.
The most prevalent wind was W. by S.
The least prevalent wind N.
The most windy day was the 5th; mean miles per hour, 34.17.
The least windy day was the 28th; mean miles per hour, 1.71.
Aurora Borealis visible on eight nights.
The electrical state of the atmosphere has indicated high tension.
Ozone was in rather large quantity.
First Steamer at Montreal 4th day.
Swallows (*Hirundo rufa*) first seen 19th day.
Frogs (*Rana Fontinalis*) first heard 21st day.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR MAY, 1859.

Barometer	Highest, the 3rd day	30.187
	Lowest, the 27th day	29.491
	Monthly Mean	29.834
	Monthly Range	0.696
Thermometer	Highest, the 27th day	99°.2
	Lowest, the 1st day	30°.2
	Monthly Mean	59°42
	Monthly Range	69°.0
Greatest intensity of the Sun's Rays		104°.6
Lowest point of Terrestrial Radiation		25°.2
Mean of Humidity		.708
Amount of evaporation		2.93 inches.

Rain fell on 9 days amounting to 3.856 inches; it was raining 52 hours 5 minutes, and was accompanied by thunder on 3 days.
The most prevalent wind was S. E.
The least prevalent wind N.
The most windy day the 22nd; mean miles per hour 9.34.
The least windy day the 5th; mean miles per hour 0.27.
Aurora Borealis visible on 2 nights.
Lunar Halo visible on 1 night.
Solar Halo visible on 1 day.
Frost on 3 mornings the 1st, 30th and 31st.
Humming birds first seen the 18th.
Lampyris Corusca (Fire flies) first seen the 24th.
Alosa (Shad) first caught the 23rd.

THE CANADIAN JOURNAL.

NEW SERIES.

No. XXIII.—SEPTEMBER, 1859.

NOTES ON LATIN INSCRIPTIONS FOUND IN BRITAIN.

PART IV.

BY THE REV. JOHN M'CAUL, LL.D.,
PRESIDENT OF UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, 26th March, 1859.

12. In the year 1752, some grave-stones* were dug up near Wroxeter, the ancient *Urioconium*,† on one of which were three panels, two bearing inscriptions and the third left vacant. According to the copy in Gough's Camden,‡ Vol. iii. pl. 1, fig. 5, these inscriptions stand thus:—

D M PLACIDA AN LV CVR AG CONIA XXX	D M DEVCOV S ANXV CVR^{A}G RATRE	

* They are now preserved in the library of Shrewsbury Grammar School.

† In the MS.S. of the Itinerary of Antoninus (*vide* ed. Parthey and Pinder, Berlin, 1848), the name is given also as *Uriconium*, *Uiriconium*, *Uroconium*, and *Viroconium*. The anonymous *Ravennas* has *Utriconion*; and in the treatise of Richard of Cirencester, *de Situ Britanniæ*, we find the forms *Viriconium* and *Virioconium*, besides *Uriconium* and *Urioconium*. It is difficult to decide which should be preferred. Mr. Wright adopts *Uriconium*, and Mr. Scarth *Urioconium*; whilst the weight of authority seems to me to preponderate in favour of *Viroconium*, the Οὐιροκόνιον of Ptolemy.

‡ I have omitted points, for I am uncertain whether the marks between certain letters, as they appear in the copy of *Gough's Camden*, which I use, are intended for points or for representations of defects in the stone, or are blemishes in the engraving or printing.

The following notice of this slab is given by Mr. Wright, in "the Celt, the Roman, and the Saxon," p. 321:—

"A monument found at Wroxeter (*Uriconium*) mentions an office, the exact character of which seems to be doubtful, though the *curator agrorum* or *agrarius*, may have been the overseer, or bailiff, of the town lands. The monument consists of a tablet in three columns or compartments; that in the middle contains an inscription to the officer; the one on the left has an inscription to the wife; the other is blank, and it has either been left so for a son, or has become erased. The central inscription is:—

D·M	To the gods of the shades.
DEVCCV	Deuccus
S· V· AN·XV	lived fifteen (?) years,
CVR·AG	he was overseer of the lands
RA TRE	of Trebonius. (?)

"The number of years is perhaps not correctly read from the stone, which seems to be in bad condition. The other inscription is:—

D·M	To the gods of the shades.
PLACIDA	Placida
AN·LV	lived fifty-five years,
CVR· AG	of the overseer of the lands
CON· I A	she was the wife
XXX	thirty years."

Independently of the objections, that there is no authority for the office of *curator agrorum*, and that no account is taken of A in the 5th line of the central inscription, I am unable to perceive any grounds for passing over the obvious interpretation of CVR·AG scil. cur[am] ag[ente]. The form is found in many sepulchral inscriptions; and on p. 315 of Mr. Wright's work we have an example:—

CVRA[M] AGENTE
AMANDA
CONIVGE.

RATRE is evidently either FRATRE, the F and R being ligulate, or PATRE, the P having been mistaken for R.

In an able and timely* summary of information relative to *Uriocoonium* by the Rev. H. M. Scarth, of Bath, which has recently been published in the *Journal of the Archæological Institute*, this with

* Wroxeter, in consequence of the discoveries which have lately been made there, is at present regarded with much interest by antiquaries, and "a well organised movement has at length been made for the exploration of the site of Uriocoonium."

the other inscriptions found at Wroxeter is given, and PATRE is adopted as the true reading of the word in the fifth line, but the letter which follows A in the 4th line is read C instead of G. In the other inscription on this tablet, the I of the fifth line is read by Mr. Scarth as J, and the A in the same line is omitted, whilst the three marks XXX at the bottom are regarded as "more probably merely an ornament, like a leaf introduced at the end of the next inscription." Adopting his readings, with the exceptions of C for G and J for I, I would give the inscriptions *in extenso*, thus:—

D·M	D[iis] M[anibus];
PLACIDA	Placida,
AN·LV	an [norum] LV,
CVR·AG	cur[am] ag[ente]
CONI	conj[uge].

D·M	D[iis] M[anibus];
DEVCCV	Deuccu-
S·AN·XV	s, an[norum] XV,
CVR·AG	cur[am] ag[ente]
PATRE	patre.

If A and XXX be retained in the first inscription, I would expand the contractions in the 5th and 6th lines, thus:—

CONI A	conjuge annorum
XXX	triginta.

i.e., her husband for thirty years.

We have a similar construction in Maffei, *Museum Veronense*, 152, 6:

C. CASSIVS. C·F
VESPA
MANLIA. T·F
REPENTINA
VXOR·AN·XXX.

It only remains to add, that I concur in Mr. Scarth's opinion, that the vacant panel was left by the father of Deuccus and the husband of Placida "for his own name and age at his decease."*

* Since the above was written, I observe that the author of a very interesting article on *Uriconium*, in *The Gentleman's Magazine* for May, 1859, has adopted Mr. Wright's views, but I am still of opinion that his interpretation cannot be received.

13. On another of these gravestones is the following inscription:

C MANNIVS	C[aius] Mannius,
CF POL SECV	C[aii] f[ilius], Pol[lia]*tribu*, Secu-
NDVS POLLEN	ndus, Pollen[tia],
MIL LEG XX	mil[es] leg[ionis] XX,
ANORVLII	an[n]oru[m] LII,
STIP XXXI	stip [endiorum] XXXI,
BEN LEG PR	ben[eficiarius] leg[ati] pr[incipalis],
H S E	[hic] [situs] e[st].

Mr. Scarth remarks, that this inscription "may be thus rendered:—Caius Mannius Secundus,* son of Caius, of Pollentum, a soldier of the twentieth legion, aged 52 years; having served 31 years in the legion and being the beneficiary of the principal legate. He rests here."

Of this rendering I would suggest the following emendations:—the insertion of the words "of the Pollian tribe" after "son of Caius," "Pollentia" for "Pollentum," and "principal† beneficiary of the legate" for "beneficiary of the principal legate." As to the first of these, it is plain that the words proposed to be inserted were inadvertently omitted. The substitution of *Pollentia* for *Pollentum* is recommended by the consideration, that there were three ancient towns so called,—one in Liguria, another in Picenum, and a third in the Balearic isles; whilst there is no authority, so far as I am aware, for *Pollentum*. In the following inscription found at Zurzach in Switzerland, (Orelli, n. 455,) we have the name almost complete:—

....GIACVS
...POLIASVPER
PO..ENTIA MILES
LEG·XI·C.P.F 7 SALNI
MAXIMI ANNORV
XXXV·STIP...

* The writer in the *The Gentleman's Magazine*, already referred to, gives the name of this soldier as *Caius Marinius Secundus Pollentius*; and adds that he "was also a pensioner of the first legion (i.e., *beneficiarius legionis primæ*), but both these readings are manifestly erroneous.

† The word "principal," as ordinarily used in English, does not convey the meaning of *principalis* as applied to a Roman soldier. The Latin term means that the person so styled was one of the *principales*, a designation given to sub-officers or officials, in contra-distinction to *munifices* or *gregarii*, which denoted the common soldiers or privates. Vide *Veget. de re Militari*, ii. c. 7.

The third emendation is confirmed by reference to Orelli, n. 3461, where we have PRINCIPALIS BENEFICIARIVS TRIBVNI, and Henzen, n. 6791, where we find PBP for *principalis beneficiarius præfecti*; but in consequence of the collocation of the abbreviations in this inscription, it is doubtful whether we should not here read, *Beneficiarius legionis præfecti*.

14. A third stone bore the following inscription:

M PETRONIVS	M[arcus] Petronius,*
L F MEN	L[ucii] f[ilius], Men[enia] *tribu*,
VIC ANN	vix[it] ann[is]
XXXVIII	XXXVIII,
MIL LEG	mil[es] leg[ionis]
XIIII GEM	XIV gem[inæ],
MILITAVIT	militavit
ANN XVIII	ann[is] XVIII,
SIGN FVIT	Sign[ifer] fuit,
H S E	h[ic] s[itus] e[st].

Mr. Scarth notices the ingenious conjecture of a friend:—

"That Petronius was a bearer of one of the *Signa* of the fourteenth legion in the famous victory over Boadicea, A.D. 61. This legion arrived in Britain in A.D. 43, when Petronius being only twenty years old was a *Miles gregarius*, and subsequently for his valour, perhaps under Ostorius Scapula, raised to the rank of *Signifer*. It could not have been much later, for in A.D. 68 the fourteenth legion was quartered in Dalmatia, (Tacitus.) He may have died in consequence of his wounds in the year 61."

It is manifestly impossible to prove the truth of this conjecture, for the fourteenth legion, after their recal from the island under Nero, were sent back in the year 69, and Petronius may have come with them then and died before they were again recalled in the year 70. The conjecture, however, is countenanced by the coincidence, that his period of service, viz.: 18 years, is the same as the intreval between the first arrival of the legion in A.D. 43, and the battle in A.D. 61. But how shall we account for his burial at Urioconium? We have no evidence that the fourteenth legion was ever stationed

* It is not unworthy of notice, that in an inscription found in Fritzheim (Orelli, n. 501), we have the same name of another soldier of this legion, a native of Claudia Celeia, in, Noricum. He, however, was the son of Caius, and had a brother, whose prænomen was Caius.

there, and it is far distant from the scene of the battle, which probably took place not far from London. Can it have been that the fourteenth legion was with Suetonius when he crossed over to Mona (Anglesey), and that on his hurried march back from Wales, Petronius was killed, or died of fatigue, at or near Uriooonium, by which route it is probable that Suetonius proceeded to London? But it is scarcely worth while to dwell on conjectures formed on such slight foundations; it is more important to observe that this inscription is the only extant British memorial of the "domitores Britanniæ."*

15. Of the many inscriptions found at Risingham, (the ancient name of which is supposed to have been *Habitancum*,)† one of the most interesting is an ornamented slab, six feet in length having an inscription which it is more than usually difficult to decipher in consequence of the great number of ligulate letters, and the injuries which the stone has sustained It is figured in Dr. Bruce's *Roman Wall*, p. 287, and in Dr. Surridge's *Notices of Roman In-*

---

* This stone has escaped the notice of Mr. Wellbeloved, for he states (*Eburacum*, p. 33), with reference to the fourteenth legion, that "it is not mentioned on any tile or in any inscription found in Britain."

† This supposition originated with Camden, who formed it on the authority of an altar which was found there, with HABITANCI on it. His conjecture derives support from Mr. Ward's reading of the words that follow HABITANCI, as PRIMA STA[TIONE], which accord with the position of Risingham, north of the wall on Watling Street. It must be borne in mind, however, that there is no notice in any ancient author of any place in Britain called *Habitancum*. But Horsley (*Britannia Romana*, p. 354) remarks:—"It may sometimes so happen, that the name of a place may be in an inscription which we meet with no where else. And of this there is in fact an instance or two in Britain; namely, *Bracchium* at *Brugh* in *Richmondshire*, and *Habitancum* at *Risingham* in Northumberland. To these perhaps may be added *Apiatorium*, in the inscription now in the library at Durham, which is probably *Newcastle*, if the altar was found there, and also *Alaterva* for *Cramond* in *Scotland*." The examples, cited by Horsley, prove the danger of depending on such authority for names otherwise unknown. *Bracchio*, which occurs in the inscription given by Horsley, p. 313, is plainly not the name of a place, but the designation of "a line of communication," as Mr. Gale correctly explained it. *Vide* Camden, ed. Gough, iii. p. 331. and add to the references given there, Livy, iv. 9; xxii. 52; and xxxviii. 5. *Apiatorio*, in n. lxxvii. Northumberland, is also not the name of a place, but of a person, for it should be read A· PLATORIO; and the individual named in it is *Aulus Platorius Nepos*, who was Legate under Hadrian. ALATERVIS, in n. xxix, Scotland, is an epithet of the *Deæ Matres*, and seems to me derived from abroad, probably from the neighbourhood of the Meuse or the Rhine, for the altar was erected by a Tungrian cohort. Possibly there was some connection between them and the goddess *Alateivia*, worshipped amongst the *Gugerni*. *Vide* Henzen, n. 5865. It is scarcely necessary to add, that there is no ground for the conjecture of Sir J. Clark (Stuart's *Caledonia Romana*, p. 171,) "that Ptolemy probably made a mistake, when translating *Alatervum* or *Alaterva castra* into Greek, and that the latter is the true reading of his πτερωτὸν στρατόπεδον."

scriptions in Northumberland, plate iii.; but the first of these is indistinct from the smallness of the scale: and the second is disfigured by the introduction of absurd conjectures.* The following is the reading given in the *Monumenta Historica Britannica*, p. cxvi. 102 *a*; and adopted by Henzen, n. 6701 :—

* * * ICOMAXI
COSIII ET M AVREL ANTONINO PIO
COS $\overline{\text{II}}$ AVG * * *
PORTAM· CVM· MVRIS VETVSTATE DI
LAPSIS IVSSV ALFEN SENECINIS VO
COS CVRANTE COL ANITI ADVENTO PRO
AVGG NN C*I VANGON OPFS
CVM AEMI SALVIAN TRIB
SVO A SOLO RESTI.

At first sight it is plain, that the emperors, named in this inscription, are Severus and Caracalla, and that the defect in the third line, after COS $\overline{\text{II}}$ AVG, was caused by the intentional obliteration of the name of Geta,—an erasure common in similar memorials of the period. Accordingly, Henzen restores the commencement with the formula: *Impp. Caess. L. Sept. Severo pio pertinaci Aug. Arabico Adiabenico Parth*ICO MAXI*mo p. m. tr. pot.* . . . and supplies the defect in the third line with *et P. Sept. Getæ nob. Caes.* As there is no room in the first line for any addition after MAXI, Henzen's suggestion "*mo p. m. tr. pot.* . . ." must be rejected; but his reading in the fifth line, VC for VO, should, in my judgment, be adopted. Vide *Canadian Journal* for May, 1859, p. 178, where I have suggested a similar emendation in an inscription also mentioning Alfenus Senecio. For COL in the sixth line, he proposes CL, *i.e.* Claudio; and O P F S he regards as the initials of the *cognomina* of the cohort, scil. O (for 8 or ⊕) *miliaria;* P, *Pia;* F, *Fidelis;* and S, *Severiana;* but he admits that there is no authority in inscriptions for any *cognomen* of this corps.

In the *Monumenta Historica Britannica*, the commencement is restored by the words: *Impp. Cæss. L. Sever. Pio Pert. P. M. Arab.*

* From Mr. Smith's *Collectanea Antiqua*, Vol. iii. P. 4, I learn that "an engraving of this slab illustrates a paper by Mr. Thomas Hodgson, in the Archæologia Æliana, Vol. iv." I regret that I have not seen it, as I have been unable to procure the work.

*Parth. Adiaben*ICO,* and the defect in the third line is supplied by *Et. P. Sept. Getæ nob. Cæs. Cos.*† In the *Index Rerum et Nominum*, p. cxlvi., *viri consularis* seems to be suggested as the explanation of VOCOS, and *C. Antistio Advento* as another reading of COLANITI ADVENTO.

From what has been stated, it is evident that the parts of the inscription as yet not satisfactorily explained, are the names COL ANITI, and the letters O P F S. It appears to me that the difficulties as to the first of these have arisen from mistaking O for C, and *vice-versa*, i.e. reading COL for OCL; and from inverting the order of the first three letters in the ligulate group TIN, i.e. reading NIT for TIN; for I have no doubt that the individual here named is the same *Adventus* who, some years afterwards, in A.D. 218, was Consul with the Emperor Macrinus. His *nomen gentilicium* is variously given as *Coclatinus*, *Oclatinus*, and *Oclatinius*. He is named in the following inscriptions:

VICTORIAE · REDVCIS · DD · NN
* * * * * * *
PII · FELICIS · AVG · ET · * * *
LIAE * * * * * *
IVGI · D · N · MILITES · LEG · II
PARTH · * * * * *
AET · Q · M · COCLATINO AD
VENTO · COS · &c. &c.

(Fabretti, p. 339, and Relandi *Fast. Consul.* p. 137.)

---

* The learned editor of the *Monumenta Historica Britannica* doubtless had authority for the collocation which he suggests of the titles of Severus; but I am not aware of any example of them in that order. They are usually placed as Henzen gives them in his restoration.

† The addition of COS seems to be justified by the fact, that in the year A.D. 205, Caracalla was Consul for the second time, and Geta for the first. In Dr. Bruce's copy of the inscription, we have, in the third line, COS I instead of COS II; but this, I presume, is a mistake. If not, we should omit COS from Geta's titles, as the inscription would then be of A.D. 202. The addition of I after COS, instead of COS alone which is the recognized form for a first consulship, suggests the conjecture, that this style may have been derived by Caracalla from his father, whose coins of his first consulship present the strange peculiarity of I after COS. Perhaps there was some reference to this in the phrase *ter et semel cos* by which the year 202 was marked. But I must add, that I have never seen an example, in the case of Caracalla, of I after COS on either coins or stones.

DEDIC · PR · ID · MART
· IMP * * AUG · COS
ET
OCLATINIO ADVENTO

(Masson *Hist. Crit.* 6, p. 215, and Orelli, n. 945.)

DIANA
CARICIANA
M AVRELIVS CARICVS
AQVARIUS HVIVS LOC
CVM LIBERTIS ET ALUM
NIS
M · D * * * D · AUG · ET
DEDIC · IDIB · AVG ·
OCLATINO · ADVENTO · COS ·

(Muratori, *Nov. Thesaur*, p. 354, n. 1; *Vide* also Henzen, ii. 6058, and Marini, *Atti di Frat. Arvali*, pp. 648–9.)

Muratori, in a note on the last inscription, enquires whether the name should be read COCLATINVS or OCLATINUS, and decides in favour of the latter; but from the second inscription, compared with that on the Risingham tablet, I am inclined to prefer OCLATINIVS. For other notices of this individual, compare Herodian, *Hist.* iv. 12 and 14; and Dio Cassius, *Hist.* 78, 14,* who was probably personally acquainted with him, as they were at the same time members of the Senate. Oclatinius Adventus was one of the most remarkable men of his time. He entered the army as a common soldier, serving amongst the *Speculatores* and *Exploratores*, who were held in very low estimation, especially as they had occasionally to discharge the

* Ed. Reimar, Hamburgh, 1752, p. 1322.

duty of executioners. Then he became successively a *tabularius* and *cubicularius*, from which he was raised to the office of *procurator*. Subsequently to his serving in England, he accompanied Caracalla in his Parthian expedition as colleague of Macrinus the *præfectus prætorio*, and was, I suspect, privy to the murder of the Emperor. After that, he was despatched by Macrinus to Rome, *ad funus Caracalli ducendum* as Reimar states in his note, but in reality to get rid of his pretensions as a rival aspirant to the imperial throne, for Adventus did not scruple to tell the soldiers, after the death of Caracalla, that the sovereignty properly devolved on him as the senior of Macrinus, but that in consideration of his advanced age he would give place to his junior. After his return to Rome he was in great favor with Macrinus, who elevated him to the rank of Senator, and to the office of *Præfectus Urbis*, a remarkable elevation, not only with a view to his antecedents, but also because at the time he was not of consular rank. Then he became consul with Macrinus, and after the death of that Emperor, in June 218, finished his year as colleague of Elagabalus.

Dio Cassus speaks of him very contemptuously, and derides his want of qualifications for the high positions to which he had attained, but his career proves that he must have been a man of very uncommon ability.

This inscription confirms the accuracy of the historian as to his having held the office of *procurator* and disproves the conjecture of Reimar, that he had been *procurator rei privatæ*. I have already mentioned Henzen's conjecture as to O P F S; it is very ingenious, but must, I think, be rejected on the ground, that there is no authority for the application of any one of the designations, *miliaria, pia, fidelis*, or *Severiana* to the first cohort of the Vangiones. I interpret the letters O P F S as the abbreviation of *operibus perfectis*, or *factis*,*—*i.e.*, having executed or completed the works. We have a similar form of expression in Gruter, cxc. n. 4: OPERIBUS AMPLIATIS RESTITVIT; and also in Morcelli, vol. ii. pp. 129 and 134. I am inclined to venture on the following restoration:

* It is scarcely necessary to add, that there are examples of O and O P for *opus*, and of P F and F for *perfecit* and *fecit* respectively.

IMPP · CAESS - -	- Imp[eratoribus] Cæs[aribus]
L · SEPT · SEVERO PIO -	- L[ucio] Sept[imio] Severo Pio
PERTINACI AVG · ARABICO	- Pertinaci Aug[usto] Arabico
*ADIABENICO PARTH*ICO MAXI	- Adiabenico Parthico Maxi[mo]
COS III ET M · AVREL · ANTONINO PIO	- Consuli tertium et M[arco] Aurel[io] Antonino Pio
COS II AUG *ET P·SEPT· GETAE N· CAES· COS·*	Consuli secundum Aug[usto] et P[ublio] Sept[imio] Getæ N[obilissimo] Cæs[ari] consuli*
PORTAM CVM MURIS VETVSTATE DI	- portam cum muris vetustate di
LAPSIS IVSSV ALFEN SENECINIS V · C ·	- lapsis jussu Alfen[i] Seneci[o]nis V[iri] C[larissimi]
COS CURANTE OCLATINI ADVENTO PRO	Consularis curante Oclatini[o] Advento pro[curatore]
AUGG NN COH I VANGON OPFS	- Aug[ustorum] n[ostrorum] coh[ors] prima Vang[i]on[um] o[peribus] p[er] f[ecti]s
CVM AEMI SALVIAN TRIB -	- cum Æmi[lio] Salvian[o] trib[uno]†
SVO A SOLO RESTI -	- suo a solo resti[tuit].

EARLY NOTICES OF THE BEAVER, IN EUROPE AND AMERICA.

BY DANIEL WILSON, LL.D.,

PROFESSOR OF HISTORY AND ENGLISH LITERATURE, UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, 4th December, 1858.

By common consent the beaver appears to have been recognised at a comparatively early date, as one of the most characteristic Canadian emblems, and it now shares with the maple-leaf such heraldic significance as pertains to our provincial cognizance. It is scarcely necessary, however, to observe that neither an exclusively Canadian nor American nativity can be assumed for this animal. It is referred to in the laws of the ancient Britons under the name of *Llosllydan y*

* Henzen (*Index*, p. 72,) gives A.D. 202, seqq., as the date of this inscription; but this is impossible, according to his reading, for Caracalla was not COS II until 205. This latter year I regard as the date, although COS III of Severus and COS II of Caracalla extended over 205–207. But if the year had been 206 or 207, we should have had, I think, the tribunitial number (TRIB. POT.) of either Severus (scil. xiiii. or xv.), or Caracalla (scil. viiii. or x.), or of both. I am not satisfied, however, as to the accuracy of the copies, which I have seen, and would suggest a careful re-examination of the stone.

† *Lucius Æmilius Salvianus* was already known as tribune of the 1st Cohort of the Vangiones from an altar, found at Risingham, the inscription on which is given by Horsley. n. lxxxi, Northumberland.

*befyr.** It had its name *beofer*, or *befer*, among our Anglo-Saxon ancestors also, centuries before the European discovery of this continent; and a designation more or less closely resembling this, is found in the classic Latin, the Sclavonic, the Lithuanic, the Scandinavian, and Germanic, and in the Romance Languages. The solitary exception to this uniformity of name appears to be the Greek χάστωρ; but the reference to it, and to the special object of the hunter's chase, in the Fable of the Beaver, ascribed to Æsop, points to the recognition of some of its most highly esteemed virtues at a period of remote antiquity.

Sir Thomas Browne in his "Enquiries into Vulgar Errors," discusses the Greek etymology, along with the popular idea involved in the Apologue of Æsop, and he remarks of it as "a tenet very ancient. For the same we find in the hieroglyphics of the Egyptians. The same is touched by Aristotle in his Ethics; but seriously delivered by Ælian, Pliny, and Solinus; the same we meet with in Juvenal:

> ———— imitatus castora, qui se
> Eunuchum ipse facit, cupiens evadere damno
> Testiculorum, adeo medicatum intelligit inguen.

It hath been propagated by emblems; and some have been so bad grammarians as to be deceived by the name, deriving *castor à castrando*; whereas the proper Latin word is *fiber*, and *castor* but borrowed from the Greek, so called *quasi* γάσωζ, that is *animal ventricosum*, from his swaggy and prominent belly."

The discovery of America with its prolific beaver-dams only multiplied the means for meeting demands already partially supplied by the resources of the old world; nor is the use of the beaver as a heraldic bearing, a novelty of American or Canadian origin.

Beverley, or Before-leag, *i. e.* beaver place, is the ancient Anglo-Saxon designation of the capital of the East Riding of York; situated in a country abounding with mere and forest in olden time, before the beaver colonists of Befor-leag were transferred from their dams to the borough arms. The oldest armorial bearings of Beverley emblazon Saint John of Beverley, seated on the fridstol, and trampling on the ancient emblem of the town: the beaver. The present seal of the corporation is: *Argent*, three waves, *sable*; On a chief, *sable*, a beaver statant regardant, *argent*.

The ancient history, and present distribution of the beaver

* Ancient Laws of Wales, published by the Record Commissioners. B. XIV. iii. 16; iv. 5.

throughout Europe and in Asia Minor, have recently been illustrated with great research and ability, in a paper communicated by Dr. Charles Wilson to the Edinburgh Philosophical Journal; in which also he treats of its ancient and modern relations to pharmacology and medicine, in the use of the Castoreum.*

In referring to the origin of the names, both of localities and individuals, naturally traceable to the presence of the beaver he remarks: "Biberach or Biberbach, in Suabia, Merian writes, had its designation from the beavers which had their colonies in a brook or stream in its vicinity. This town was an old *Reichs-stadt*, and, like our Beverley, had long carried the beaver in its armorial insignia. The animal we are told, was first borne *azure*, with a crown *gules*, on a field *argent*; but, in 1487, in consideration of an important service rendered to the Archduke Maximilian, afterwards the Emperor Maximilian I., the citizens acquired the right to have the field *azure*, and the beaver and crown *or*: a guerdon which we must suppose them to have considered adequate, as they obtained it on petition. There is besides a Bieberach on the Kinzig, a tributary of the Rhine; and on the Rhine itself we have Biebrich, probably the analogue of our *Beferige*, whence our patronymic *Beveridge*."

The ingenious architecture and the social and provident habits of the beaver supply very satisfactory reasons for its selection from among the North American fauna, as the fittest for taking its place among the ordinaries or charges of our provincial escutcheon; but this was probably less thought of than its great importance in the early trade of Canada, and the British American Colonies.

Nevertheless, though the beaver wool of the fashionable hats, to which it gave name, is scarcely less exclusively associated with the early exports of the New World than its tobacco, we have good proof of the use of the beaver's fur for such a purpose, and of a regular European traffic in beaver skins, long prior to the discovery of America, in the fifteenth century. The beaver skin appears indeed to have been from ancient times a royal fur, and her Majesty is still entitled, by royal prerogative, to the skin of the martin, the beaver, and the ermine, though the latter alone has maintained its royal associations. On the continent, the use of the beaver's skin appears to be traceable in the middle of the 14th century; and in "the Tes-

* Edinburgh New Philosophical Journal, Vol. VIII.

tatement of Crescide" printed in all the earlier editions of Chaucer's works, but assigned by Urry and later editors to the Scottish poet, Robert Henrysone, (cir. 1450,) we find the costume of one of his characters thus described:

> Whan in a mantell and a *bever hat*,
> With cuppe and clapper wonder priuely
> He opened a secrete gate and out thereat
> Conveyed her, that no man should espie.

It was not however, till the vast resources of the forests of the new world had become known, that beaver wool became the indispensable material for the fashionable European hat. Nearly a century and a half after the discovery of America we at length find Charles I. in 1638, by royal proclamation prohibiting the use of any materials except beaver wool in the manufacture of hats, unless made for exportation. This royal prohibition amounted to a declaration of war by the king of England against the beaver settlements of his North American Colonies and the Hudson Bay Company's territories; and within less than a century thereafter, they appear to have been almost totally exterminated from the colonies to the south of the St. Lawrence and the great lakes. The French traders in 1743, imported into Rochelle, 127,080 beaver skins, and the British Hudson's Bay Company sold 26,750 skins the same year. Within less than half a century thereafter, when Canada had become a British possession, the trade in beaver peltries seems to have reached its maximum, and to have been maintained with only a slight decline till the commencement of the present century. In 1788, upwards of 170,000 beaver skins were exported from Canada, and the value of those forwarded to England from Quebec alone, in 1808, is estimated at nearly £119,000 stg. The effect of such a wholesale destruction of the poor beaver could not fail to become apparent, notwithstanding the vast regions of the North-West over which the Hudson's Bay trapper and the Indian hunter ranged in pursuit of their defenceless prey. The great fur companies at length became impressed with the danger this profitable branch of their trade was exposed to, and even the improvident Indian learned to systematize his mode of beaver trapping so as to avert its total extermination. The Iroquois and Hurons,—among whom the beaver was known as the *Tsoutayè*,—were especially skilled in its pursuit, and their habit was always to leave at least one pair in the beaver-dam, and to let this remain un-

molested for four or five years, while they pursued the chase in other localities.

In addition to this, however, the imperfect weapons of the Indian hunter, formed no slight protection to the Beaver; and so long as it was pursued alone by the native, unaided by the traps and guns of the European, its numbers suffered no very material diminution. Its settlements formed accordingly a singularly characteristic feature of the New World, which could not fail to impress the observant traveller. I find it, indeed, assigned as the rival of the Indian in the occupation of the soil, in the manuscript journals of the late Mr. David Thompson,* who upwards of sixty years ago explored the Great North West, and was the first discoverer of the passes in the Rocky Mountains, the importance of which is only now being recognised. Writing in 1794, he thus observes in reference to the beaver, and its native hunter:—

"Previous to the discovery of Canada, about 320 years ago, this Continent from the latitude of forty degrees north to the Arctic Circle, and from the Atlantic to the Pacific Ocean, may be said to have been in the possession of two distinct races of beings,—man and the beaver. Man was naked and had to procure clothing from the skin of animals; his only arms were: a stake, pointed and hardened in the fire; a bow with arrows, the points hardened with fire, or headed with stone or bone of the legs of the deer; a spear, headed in the same manner, and a club of heavy wood, or made of a round stone of four or five pounds weight, inclosed in raw hide, and by the same wound round a handle of wood of about two feet in length, bound firm to the stone. Such were the weapons man had for self-defence, and with which to procure his food and clothing. Against the bones of an animal his arrows and spear had little effect, but the flank of every animal is open, and thither into the bowels the Indian directed his fatal and unerring arrows.

"Besides his weapons, the snare was much in use, and the spear to assist it for large animals; and by all accounts the deer and fur-bearing animals were very numerous, and thus man was lord of the dry land and all that was on it. The other race was the beaver, they were safe from every animal but man and wolvereens. Every year each pair having from five to seven young, which they carefully reared, they became innumerable; and, except the great lakes, the waves of which are too turbulent, occupied all the waters of the northern part of the Continent. Every river where the current was moderate and sufficiently deep, the banks at the water edge was occupied by their houses. To every small lake

* By the courteous permission of the son of the author, I have been favoured with access to Mr. Thompson's valuable journals, through the intervention of the Deputy Commissioner of Crown Lands, Andrew Russell, Esq. The journals embrace the results of observations extending over a period of 35 years: and are comprised in 67 volumes, full of information alike curious and valuable.

and all the ponds they builded dams, and enlarged and deepened them to the height of the dams. Even to grounds occasionally overflowed by heavy rains they also made dams, and made them permanent ponds, and as they heightened the dams increased the extent and added to the depth of water; thus all the low lands were in possession of the beaver and all the hollows of the higher grounds; small streams were dammed across, and ponds formed on the dry land, with the dominion of man contracted. Every where he was hemmed in by water without the power of preventing it: he could not diminish their numbers half so fast as they multiplied, their houses were proof against his pointed stake, and his arrows could seldom pierce their skins.* In this state man and the beaver had been for many centuries, but the discovery of Canada by the French, and their settlement up the St. Lawrence, soon placed the natives far superior to the beavers. Without iron man is weak, very weak, but armed with iron he becomes the lord of the earth; no other metal can take its place. For the furs which the natives traded they procured from the French, axes, chisels, knives, spears, and other articles of iron, with which they made good hunts of the fur-bearing animals, and procured woollen clothing. Thus armed the houses of the beavers were pierced through, the dams cut, and the water of the ponds lowered or wholly run off, and the houses of the beaver and their burrows laid dry, by which they became an easy prey to the hunter.

" The average weight of a full grown male beaver is about fifty-five pounds, his meat is agreeable to most, although the fat is oily; the tail is a delicacy. They are always in pairs, and work together. Their first business is to ensure a sufficient depth and extent of water for the winter, and if nature has not done this for them they make dams to obtain it. If there are more families than one in a piece of water they all work together, each appearing to labor on a particular part. The dam is made of earth, and pieces of wood laid oblique to its direction. The wood employed is always of aspen, poplar, or large willows and alders; if pine is used it is through necessity not by choice; the bottom is well laid, and if small stones are at hand they make use of them for the bottom of the dam; the earth is brought between their fore paws and throat, laid down, and by several strokes of the tail made compact; the pieces of wood are with their teeth, which are very sharp and formed like small chisels, cut into the lengths they want, brought to the dam and worked in, and thus the dam is raised to the height required. It is a remark of many that dams erected by the art of man are frequently damaged or wholly carried away by violent freshets, but no power of water has ever carried away a beaver dam. Having secured a sufficient depth of water each family builds a separate house; this is in the form of a low dome; from the doorway, which is a little way in the water, gradually rising to about thirty inches in height and about six feet in diameter; the materials are the same as those of the dam and worked in the same manner, only the pieces of wood are much shorter, and if at hand small flat stones are worked in. The coating of the first year may be about four to five inches thick, and every year an additional coat is added, until it is a foot or more in thickness, grass then grows upon it and

* In my travels thousands of the natives were not half so well armed.—D. T.

it looks like a little knowl. The next work is to make burrows of retreat the first year seldom more than one or two can be made, and sometimes none. These are carried on from a few inches below the surface of the water, direct from it, gradually rising, of about a foot in height by twenty inches in breadth, so that a beaver can turn in them; their length depends on the easiness of digging the ground, the general length is about ten feet, but in good earth they often are of twenty feet or more. The second and third year the number of burrows are augmented to five or six, and where the beaver have been a long time the ponds and small lakes have numerous burrows.

"The Indians think the male and female are faithful to each other. They bring up their young for the first year with care and protection, until the next spring, when the female is about to litter she drives them all away, and some of them before they can be made to stay away receive severe cuts on the back from the teeth of the old ones. The young beavers are very playful and whimper like children. The beaver is supposed to attain to the age of fifteen years, some think twenty years. The beaver hunter is often at a loss what to do, and sometimes passes a whole day without coming to a determination. His shortest and surest way is to stake up the doorway of the house, the stakes he carries with him ready for the purpose; but the beavers are so watchful that his approach is heard, and they retire to their burrows. Some prefer first finding the burrows and closing them up with stakes, and cutting off retreat from the house. Whichever method he takes difficulties and hard labour attend him. To determine the place of the beavers, as the whole family of seven or nine are seldom all found in the house, the Indian is greatly assisted by a peculiar species of small dog, of a light make, about three feet in height, muzzle sharp and brown, full black eyes, with a round brown spot above each eye, the body black, the belly of a fawn color; its scent very keen and almost unerring. This dog points out by smelling and scratching the weakest part of the beaver house, the part where they lie, and the same in the burrows, which are then doubly staked. The Indian with his axe and ice chisel makes a hole over the place shown by the dog. The beaver having changed its place, to find to which end of the burrow it is gone a crooked stick is employed until it touches the beaver, another hole is made and the beaver is killed with the ice chisel, which has a heavy handle of about seven feet in length. When the dog smells and scratches at two or three places on the beaver house it is a mark that there are several in it; the doorway being doubly staked, the Indian proceeds to make a hole near the centre of it to give full range to his ice chisel, and not one escapes; but all with hard labor. Such was the manner of killing the beaver until the introduction of steel traps, which, baited with Castoreum, soon brought on the almost total destruction of these numerous and sagacious animals."

Such were the reflections of an acute and sagacious observer upwards of sixty years since, when the speedy extermination of the beaver seemed inevitable. Before, however, the substitution of silk for the beaver wool had procured for the ingenious rodent, some respite from anihilation, other materials were brought into use for the same pur-

pose. One of these was the fur of the Coypou, (*moyopotamus Bonariensis* of Commerson,) an aquatic rodent, somewhat smaller than the beaver, which abounds in Chili, Buenos Ayres, and other parts of South America. Like the beaver and the seal, it has two kinds of fur: a long and coarse ruddy hair, with soft and downy fur underneath. Its commercial value is dependent on the latter, which supplies the place of the beaver down, and the demand became so great, that within recent years the exportations for Great Britain alone, in a single season, principally from the Rio de la Plata, have been stated as high as 800,000 skins, besides those sent to France and other countries. Even those, however, in addition to the immense importations of the true beaver fur, proved inadequate to the demands of commerce; and by their great cost contributed to the introduction of silk as a substitute, which has now to a considerable extent superseded the beaver down. The ultimate consequence has been the greatly diminished zeal in the chase of the beaver, owing to the constant decrease in the value of the skin. Nevertheless, the beaver skins imported into Britain from Canada and the United States, so recently as 1829, were valued at upwards of £70,000 stg. Compared with the value of importations forty years previously, this shows a decrease of considerably more than one half; but the existence of sources for such a supply, after the relentless warfare waged against the beaver settlements, without intermission, for upwards of two centuries, proves how prolific the beaver is, and how numerous and widely diffused the species must originally have been. Traces of ancient beaver villages are said to have been noted as far south as Louisiana, and from that southern latitude their disappearance has gradually preceded that of the red Indian, in his escape from the exterminating pressure of the white man, into the wilds of the north-west.

The geographical range of the beaver commences about latitude 70° extending across the continent wherever the soil is sufficiently fertile to furnish a wooded retreat, and the requisite vegetable food. Dr. Richardson describes them on the banks of the Mackenzie, the largest and best wooded of all the rivers falling into the Polar Sea,—and as still pretty numerous to the northward of Fort Franklin, in the swampy grounds near the Great Bear Lake. There it is probable that some remnant of the beaver tribe, which once built its huts on the banks of the Ohio and the Mississippi, may escape extermination; but throughout the whole of Canada proper, and far beyond its

boundaries the sole memorial of the beaver will probably be preserved, ere long, only in some rare "Beaverton," "Beaver Creek," or other topographical indication of a former settlement of the acquatic builders, like the ancient Beverley of Yorkshire, or the sepulchral mound still marked with the totem of its Indian hunter on his grave post.*

The country lying between Lake Ontario and the Georgian Bay, and extending eastward to the Ottawa, appears to have been the head quarters of the beaver in Canada proper, at the time when the sole value of Upper Canada to its European claimants was as a fur-trading area. The old French writers repeatedly speak of it as the Great Beaver Country. The Iroquois from the southern shores of the lake frequently crossed for the purpose of beaver-hunting in the fall of the year; and one of the reasons assigned for the establishment of a French post at Cataraquis was to intercept the trade in beaver skins on its road to the British settlements. The whole country is full of old beaver settlements, almost every stream having a succession of them upon it, which, now that the dams have been broken down, are converted into beaver meadows, from which the lumberers and early settlers drew a large supply of hay. The older settlers speak of the beaver having been almost unknown throughout this district, but since the price of beaver skins has fallen from six or eight dollars, to less than one dollar per pound, while the value of labour has been constantly on the increase, the beaver has only been assailed at irregular intervals by the stray sportsman or Indian hunter, and it has been latterly increasing in some districts much more rapidly than the settlers, by whom it must nevertheless ultimately be displaced.

Were it not, indeed, for the peculiar habits of the beaver, which

* The same topographical evidence serves in Britain to indicate the ancient locations of the beaver. Beverley, in Yorkshire, has been referred to. The "Codex Diplomaticus Ævi Saxonici" supplies such names as *Beferburne*, *Beferige*, *Beferic*, and Dr. Charles Wilson further illustrates the subject as follows: "In the Glossary of Ælfric the Anglo-Saxon Archbishop of Canterbury near the close of the tenth century, appended to his 'Grammatica Latino-Saxonica,' we have the *Befer* rendered as the *Fiber* or *Castor Ponticus*. The annex in each name: *burne* (brook), *ige* and *ic*, or *icg* (island), and *luc* (inclosed space, fence), is entirely apposite, and suggests to us so perfectly the ordinary habitat of the animal, or the construction of its dam, as to establish at once the certainty of its having existed at the individual place in the Anglo-Saxon period. Again, in an ordinance of Edward I. for the government of Scotland, dated in 1305, we find William of *Bevercotes* named as chancellor of the kingdom; and here we are reminded of the huts (Anglo-Saxon *cote*), of the beaver, a cluster of which had evidently led to the territorial designation of this dignitary. There is a "Bevere Island," which lies about three miles north of the city of Worcester, which is popularly understood to have been so denominated from its having been frequented by beavers; and doubtless it might be easy to glean elsewhere many similar local designations."

render its continuance incompatible with the aggressive encroachments of the colonist and settler; the respite which it has thus found, added to its rapid reproduction when left unmolested, might ere long restore it to many of its forsaken haunts. Even now beaver dams are to be met with, comparatively near large settlements, as on the Otonabee, within a few miles of Peterborough, and in the Nottawasaga district; and the beaver may even be described as of frequent occurrence to the north of the Ottawa, and in the head waters of the streams which flow southward into the St. Lawrence. By the Indian, however, it is greatly prized as an article of food, while its tail is sought after both by the Indian and the white trapper as a peculiar delicacy; nor can its skin ever become altogether valueless to the fur trader. Under all these combined influences it would be vain to hope that the beaver can long survive the encroachments of the clearings on the chosen scenes of its ingenious labours. The extent, however, to which such labours were carried, in localities where the gregarious instincts of the builders had full play, may be inferred from the following note recorded by Mr. David Thompson in 1794, introductory to his report of a curious dialogue with an old Indian, relative to the native ideas and traditions concerning this favourite prize of the north-west trapper. From this it will be seen that even sixty years ago Mr. Thompson speaks of the total destruction of the beaver as inevitable.

"On a fine afternoon in October 1794, the leaves beginning to fall with every breeze, my guide informed me that we should have to pass over a long beaver dam. I naturally expected we should have to lead our horses carefully over it. When we came to it, we found it a stripe of apparently old solid ground, covered with short grass, and wide enough for two horses to walk abreast. The lower side showed a descent of seven feet, and steep, with a rill of water from beneath it; the side of the dam next to the water was a gentle slope. To the southward was a sheet of water of about one mile and a half square, surrounded by low grassy banks. The forests were mostly of aspen and poplar, with numerous stumps of the trees cut down and partly carried away by the beavers. In two places of this pond were a cluster of beaver houses, like miniature villages.

"When we had proceeded more than half-way over the dam, which was a full mile in length, we came to an aged Indian, his arms folded across his breast, with a pensive countenance looking at the beavers swiming in the water, and carrying their winter's provisions to their houses. His form was tall and erect, and his hair almost white, the only effect that age seemed to have on him, though we concluded he must be about eighty years of age, and in this opinion we were afterwards confirmed by the ease and readiness with which he spoke of things long past. I enquired of him how many beavers' houses there were in the pond before

us, he said there are now fifty-two; we have taken several of their houses; they are difficult to take, and those we have taken were by means of the rise of the water on their houses from a strong wind which enabled us to stake them in, otherwise they would have retired to their burrows which are very many. He invited us to pass the night at his tent which was close by; the sun was low and we accepted the offer. In the tent was an old man almost his equal in age, with women and children; we preferred the open air and made a good fire to which the old men came, and after smoking a while conversation began. I had always conversed with the natives as one Indian with another, and been attentive to learn their traditions on the animals, on mankind, and on other matters in ancient times, and the present occasion appeared favorable for this purpose. Setting aside answers and questions which would be tiresome; they said:—by early tradition, of which they did not know the origin, the beaver had been an ancient people and then lived on the dry land; they were always beavers, not men, they were wise and powerful, and neither man nor any animal made war on them.

They were well clothed as at present, and as they did not eat meat, they made no use of fire and did not want it. How long they lived this way we cannot tell but we must suppose they did not live well, for the Great Spirit became angry, and ordered Weesaukejauk to drive them all into the water, and there let them live, still to be wise, but without power, to be food and clothing for man, and the prey of other animals, against all which his defence shall be his dams, his house and his burrows; you see how strong he makes his dams; those that we make for fishing rivers are often destroyed by the water, but his always stand. His house is not made of sand or loose stones, but of strong earth, with wood, and sometimes small stones, and he makes burrows to escape from his enemies, and he has always his winter stock of provisions secured in good time. When he cuts down a tree, you see how he watches it, and takes care that it shall not fall on him. "But if so wise, for what purpose does the beaver cut down large trees of which he makes no use whatever?" "We do not know; perhaps an itching of his teeth and gums." Here the old Indian paused, became silent, and then in a low tone talked with the other, after which he continued his discourse. "I have told you that we believe in years long passed away, the Great Spirit was angry with the beaver, and ordered Weesaukejauk (the Hatter,) to drive them all from the dry land into the water; and they became and continue very numerous; but the Great Spirit has been and now is, very angry with them, and they are now all to be destroyed. About ten winters ago, Weesukejauk showed to our brethren, the Nepissings and Algonquins, the secret of their destruction; that all of them were infatuated with the love of the Castoreum of their own species, and more fond of it than we are of fire water. We are now killing the beaver without any labor; we are now rich, but shall soon be poor, for when the beaver are destroyed we have nothing to depend on to purchase what we want for our families; strangers now overrun our country with their iron traps, and we and they will soon be poor."

Some three years ago (1797), the Indians of Canada and New Brunswick, on seeing the steel trap so successful in catching foxes and other animals, thought of applying it to the beaver, instead of the awkward wooden traps they made, which often failed; at first they were set in the landing paths of the beaver, with about

four inches of water on them, and a piece of green aspen for a bait, that would allure the beaver to the place of the trap. Various things and mixtures of ingredients were tried without success; but chance made some try if the male could not be caught by adding the castoreum beat up with the green buds of the aspen. A piece of willow of about eight inches in length, beat and bruised fine, was dipped in this mixture; it was placed at the water edge about a foot from the steel trap, so that the beaver should pass direct over it and be caught; this bait proved successful, but to the surprise of the Indians the females were caught as well as the males. The secret of this bait was soon spread; every Indian procured from the trader four to six steel traps, the weight of one was about six to eight pounds; all labour was now at an end, the hunter moved about at pleasure, with his traps and infallible bait of castoreum. Of the infatuation of this animal for castoreum, I saw several instances. A trap was negligently fastened by its small chain to the stake, to prevent the beaver taking away the trap when caught; it slipped, and the beaver swam away with the trap, and it was looked upon as lost. Two nights after, he was taken in a trap, with the other trap fast to his thigh. Another time, a beaver passing over a trap to get the castoreum, had his hind leg broken, with his teeth he cut the broken leg off, and went away. We concluded he would not come again, but two nights afterwards, he was found fast in a trap; in every case tempted by the castoreum. The stick was always licked or sucked clean, and it seemed to act as a soporific, as they remained more than a day without coming out of their houses. The Nepissings, the Algonquins and Iroquois Indians, having exhausted their own districts, now spread themselves over these countries and as they destroyed, the beaver moved forward to the northward and westward. The natives, the Napataways did not in the least molest them; the Chippeways and other tribes made use of traps of steel, and of the castoreum. For several years all those Indians were rich, the women and children, as well as the men were covered with silver brooches, ear-rings, wampum, beads and other trinkets. Their mantles were of fine scarlet cloth, and all was finery and dress. The canoes of the fur trader were loaded with packs of beaver, till the abundance of the article lowered the London prices. Every intelligent man saw the poverty that would follow the destruction of the beaver, but there were no chiefs to control it; always perfect liberty and equality. Four years after almost the whole of these extensive countries became poor, and with difficulty procured the first necessaries of life, and in this state they remain, and probably for ever. A worn out field may be manured and again made fertile; but the beaver once destroyed cannot be replaced. They were the gold coin of the country, with which the necessaries of life were purchased.

This idea of the beaver skins being the current coin, or the dollar bills of the Hudson's Bay territory and the regions surrounding the fur countries, is frequently referred to; and continued to be the case, down to very recent years. It is again noticed by Mr. Francis Assikinack, in introducing some notes of the beaver traditions of his own tribe, the Odahwahs, with which he has favoured me. It can

scarcely fail to remind the classical philologist of the primary derivation of the Latin *pecunia*, the oxen of Homer, and still more of the skin currency of the Carthaginians and Spartans; while the Biblical student will recall the sneering comment of Satan on the patience of Job: "Skin for skin, yea all that a man hath will he give for his life."

In the Odahwah language, a dialect of the Ojibway, the beaver is called, *Ahmik*,—the Ahmeek, king of beavers, of Longfellow's "Song of Hiawatha." So also a beaver dam is *ahmikweesh* or *ahmikobeeg*. No recollection can now be traced of the beaver's tooth having ever been used as a cutting instrument by the Odahwahs; but one of their superstitions seems to point to such a practice. It was believed that the beaver possessed a piece of brass for the purposes of cutting. This tool was said to resemble a wedge, one side of which was very sharp. Sometimes the most celebrated magicians professed to obtain this instrument from the animal, and it was considered a most invaluable treasure, as it answered as a universal charm in strengthening medicine, obtaining the necessaries and luxuries of life, securing success in hunting, &c. Until very lately these Indians reckoned dollars by the beaver skin, and where the whites say one dollar, two dollars, and so on, the Indians would say, one beaver skin, two beaver skins, &c. Formerly, also, every section of a tribe had its own beaver hunting grounds; and this property, as it may fitly enough be called, descended from father to son for the benefit of the family exclusively. To encroach upon a beaver ground belonging to another party was looked upon as a serious offence, and the trespasser was liable to lose his life, if caught by the owners of the ground.

According to Odahwah tradition there was an immense beaver in some part of Lake Superior. The Indians pointed out an Island in the Lake, about two miles long, and one and a third broad, and said that the beaver spoken of was the same size. This story must have been invented very early, because in one of the legends relating to Nanahbozho, it is told that this extraordinary personage went in one morning to Lake Superior for the purpose of catching a beaver for his breakfast. When he got there he succeeded in dislodging a young beaver from its hiding place, and chased it towards the Sault Ste. Marie, the animal of course came under the water, until it reached the entrance of the river leading from Lake Superior into Lake Huron. Nanahbozho thought that the Sault was an excellent place to catch the beaver, as the water was too shallow to conceal it. So he went there and oc-

cupied the place, standing on the British side of the river. Whilst he stood there, watching closely, a bird flew on the American side, he stooped and picked up a stone to throw at it; his attention being thus drawn away from the narrow passage the beaver had an opportunity to dart down the rapids, Nanahbozho threw the stone hastily at the bird, and then renewed the chase. This stone is to be seen at the present day on a sandy beach at the other end of Lake Michigan, being about thirty feet in diameter, where it is the solitary one on the beach. The next place selected by the great hunter is a narrow channel between Manitoulin Island and the mainland, where he took up his position at *Ahssine muddwawa*, called by the French, LaCloche. He had hardly got there when the beaver showed its head in the middle of the channel. Its pursuer hurled his spear at it, but missing his aim, the weapon went beyond his reach, and being in a great hurry, he did not wish to lose time in going for it. This celebrated spear is also to be seen at present in the shape of a mountain having two peaks, about twenty miles from the place whence it was thrown. About two hours after, he caught the beaver in the Ottawa, and dashed its head on the rocky banks of the river, where the Indians say the marks of blood are still to be seen.

When a beaver kitten as it is called, is taken young, it is easily tamed, and seems to throw off its natural habits and to abandon most of its wild instincts, almost as readily as the dog; and with a much shorter training. In "The gardens and menagerie of the Zoological Society, delineated," a highly interesting account is given of Binny, a tame beaver, domesticated by Mr. Broderip, and which developed its building instincts in the construction of dwellings and imaginary dams for its self with books, brushes, boots, shoes, and whatever lay within its reach. It proved an exceedingly affectionate and entertaining favourite. It does not however, appear to have manifested its peculiar instincts in the destructive form they frequently assume in captivity. A gentleman resident in Lower Canada, informs me, that he had a tame beaver which used to play with the children like a kitten, but as is commonly the case, it took to gnawing furniture. I am indebted to my friend Mr. John Langton for the following account of another tame beaver, domesticated under different circumstances. The owner of this beaver had no furniture to gnaw, being an old trader married to a squaw, and living more like an Indian than a white man. "His favourite was quite tame, and very playful, and though he lived on the shore of Buckhorn

Lake, the beaver seldom took to the water. It used to lie before the fire as contentedly as a dog; and it was not till winter set in that it became a nuisance. Poor old Bill McHugh's house was well ventilated, an open chink between the logs being thought very little of, by him and his family; but the beaver was very impatient of such negligence, and used to work all night at making things airtight and comfortable, without much discrimination as to the materials it employed. If Bill or his guests went to bed leaving their moccasins and tichigans drying before the fire, they were certain to be found in the morning stowed away in some chink or cranny; and stray blankets and articles of clothing were torn up by the industrious beaver, for the same purpose. The consequence was that the poor pet was at length sacrificed; its body went into the old trader's pot, and its skin to market." When we consider the peculiar shyness of the beaver in its native haunts,—in so much so that, where it is liable to frequent disturbance in the vicinity of the Settlements, it is scarcely possible to get a sight even of its head above water after watching for hours,—the readiness with which it abandons all its wild habits and natural instincts, and adapts stself to sociable companionship with man, constitutes a trait of peculiar interest.

Such being some of the aspects in the natural history of the beaver, *Castor Fiber*, as studied in its comparatively recently disturbed haunts in the New World, some interest may naturally be felt by us here, in the recovery of like traces of its former presence in numerous localities of the Old World, from which it has disappeared for centuries. The relations of the European beaver to pharmacology and medicine have attracted a degree of attention to it in earlier times, to which we owe much of the knowledge now recoverable concerning its early history and wide diffusion. The medicinal virtues attached to the castoreum in early and medieval times were of the most varied and even contradictory kind. Hippocrates recommended its employment in uterine diseases, while Dioscorides and many later writers prescribe it for accelerating child-birth. According to Pliny, when applied externally to the head the castoreum induced sleep, but when used in fumigation it removed lethargy. Its uses and virtues might indeed compare with the most wonderful of modern universal quack medicines. Those have been carefully investigated in Dr. Charles Wilson's "Notes on the use of the Castoreum," and to them we can only add, from the New World, two others to which it is applied in the great

region of the North-west, where still it forms an important object of the chace. To one of these reference has already been made in an extract from the Journal of Mr. David Thompson, where it is seen that the castoreum is succssfully employed as a bait in trapping both the male and female beaver. The other use is as an accompaniment of tobacco. Both the Indians and the Hudson's Bay Company's traders frequently place a small portion of the castoreum in their pipe along with tobacco. The flavour is very peculiar, and the smell of the smoke totally different from that of the castoreum itself, but by no means unpleasing. No special effects, however, seem to result from its use in this manner, so diverse from any of the ancient or modern European modes of prescription. That the beaver was at one time indigenous to the British Islands is well known. Its remains have been discovered under circumstances indicative of an antiquity coeval with the extinct mammoth (*Elephas primigenius.*)* But their most frequent situation is at the bottom of the peat-bog; as in the Newbury peat-valley, where they were found twenty feet below the present surface, associated with the remains of the wild-boar, roebuck, goat, deer, and wolf. The *Castor Europæus* accordingly occupies an interesting place among the extinct animals referrible to the primeval transition of the British Archæologist, as it is proved to have existed as a living species, both in Scotland and Wales, down to the twelfth century, and as we shall see is referred to so late as the fifteenth century.† In 1788, Dr. William Farquharson presented to the Society of Antiquaries of Scotland, the skeleton of the head, and one of the haunch bones of a beaver, dug up in Martie's Loch of Kinloch, near Coupar Angus, Perthshire. The bones are dyed of a deep brown color, derived from the peaty marle in which they were found embedded; and the cranium is imperfect. But the remains of the remarkable incisors so characteristic of the beaver, still exist in the lower jaw bone. This interesting palæontological relic I recalled to mind with lively interest when exploring a deserted beaver-dam on the Eagle River, Lake Superior, in 1855, and all the more from the recollections of a conversation with Hugh Miller, on the primeval archæological era of Scotland, to which it gave rise, when accompanying that distinguished geologist on one occasion over the Museum of the Scottish Antiquaries. From the nature of his speculations concerning the ancient life of the New Red Sandstone, the fossil beaver spoke to

* Owen's British Fossil Mammals, p. 191.
† Prehistoric Annals of Scotland. pp. 24, 193.

him of very modern times, while to his companion,—then occupied with investigations exclusively confined to the era of man as an occupant of the globe,—it was a memorial of ages belonging to a transitional era during which the ancient earth gave place to that of which man was henceforth to be the chief denizen. The most memorable result of that conversation, was, the explanation then given of ideas he had formed, relative to a chronological key to the age of the existing and ancient Scottish coast lines, based on the height from the present sea level of the caverns abounding along its rocky shores, when taken into consideration with the relative depths of excavation of these sea-worn recesses, some of which may be seen in process of formation, especially where the long roll of the Atlantic wave is abruptly arrested by the rock-bound coast of the western Highlands. This, with so many other ingenious speculations and profoundly suggestive thoughts, of which such mere hints survive, were doubtless intended to be embodied in the great work on Scottish Geology, which now remains an unaccomplished idea.

But such reminisences tempt me away from the subject in hand; though in returning to it, I am again reminded of old Edinburgh associates and friends, in naming the late Dr. Patrick Neill. In 1819, Dr. Neill read an interesting paper before the Wernerian Natural History Society of Edinburgh,* in which he referred to the specimen of the extinct Scottish beaver, preserved in the museum of the Society of Antiquaries, describing the circumstances under which it was found, and specially noting the discovery in a neighbouring marl-pit of the two metatarsal bones, and a pair of branched horns of a large extinct species of deer. In the same paper, Dr. Neill drew attention to another disclosure of similar fossil remains, the recent discovery of which had then led to the revival of the subject. These, which were found in October, 1818, included the entire skeleton of a beaver, lying partially embedded in marl, under an accumulation of peat moss seven feet in thickness. In this were recognized the shells of filberts, with the wood of the birch, alder, and oak. Only the skull and lower jaw were recovered, the other bones having been found in too soft and fragile a condition to admit of removal, aud they are now preserved in the Museum of Edinburgh University. Here also were found, a gigantic pair of deer's horns; and, what is of more interest, the writer

* Edinburgh Philosophical Journal, Vol. I., p. 183. Mem. Wernerian Natural History Society, Vol. III., p. 207.

of the statistical account of the Parish of Edrom,* states that several other heads of the beaver were recovered from the same deposit. Here therefore, it is not presuming too much to assume was the marle deposited from the lake where in ancient centuries a colony of Scottish beavers had constructed their habitations; while the accumulated vegetable moss with its enclosed relics of the ancient forest, might help us to some guess as to the probable era of their extinction: not necessarily one prior to that of man, for the rude monoxylous British canoe, hollowed by fire out of a single tree, like those in use by the Indians on the Columbia River, has been found at as great a depth in more than one of the Scottish mosses.†

But the traces of the former existence of the beaver in Scotland have received additional illustration from the researches of Dr. Charles Wilson, in the paper already referred to, in the Edinburgh Philosophical Journal. In this the author thus describes a third instance of the discovery of the remains of the beaver in Scotland, with the traditional associations of the locality where it was found:—

"On the verge of the parish of Linton, in Roxburghshire, there is a remnant of what has evidently once been a far more extensive loch, which had skirted for some distance the outer range of the Cheviot Hills, but which, from some alteration of the levels, has now, for the most part, gradually drained itself off to the westward. Into this loch had flowed the waters of the Cheviots, entering it, as the little river Kail, by a narrow gorge towards the eastern extremity: and it is doubtless through the agency of this often impetuous current, that those alterations have chiefly been effected which have diverted the stream from what is now the narrow limits of Linton Loch; and left it contracted to a few stagnant pools, imbedded in a deep but not extensive morass, from which, however, still flows a considerable body of water by an artificially constructed channel. The near vicinity of the loch presents many localities of interest, as well in legendary lore as from later associations. The hollow at Wormington, still known as the 'worm's hole,' marks, according to familiar story, the ancient haunt of a monstrous serpent or dragon, the destruction of which, by William de Somerville, obtained for him the gift of the surrounding barony from William the Lion. The little knoll, consisting wholly of fine sand, on which the church of Linton is built, has seemed to the peasant to justify the tradition, that its elevation was the work of two sisters, who sifted the heap as a voluntary penance, to expiate in a brother the crime of murder. The traces of the foundations of the neighbouring fortalice, still lurking under their covering of green sward, recal the memory of more than one of the scarcely less stirring, while more authentic scenes of border warfare;

* New Statistical Account; Berwick, p. 267.

† Prehistoric Annals of Scotland, p. 31.

and closer to the loch, perched above its southern margin, we have the little possession of Wideopen, the inheritance of the poet Thomson, who is said to have gathered here, among the storms of the hills, many of the materials for the admirable descriptions in his poem of Winter. Through the adjoining tract of the Cheviots, spreads that range of which it could be said, as in the ballad of the Battle of Otterbourne:

> The deer runs wild on hill and dale,
> The birds fly wild frae tree to tree.

Few places, therefore, could be more appropriate for the discovery of any remains which were to aid in giving body to our traditions, as in forming a link between remote and existing states of civilization.

The moss, which constitutes the body of the Linton morass, is variable in depth, and covers a very extensive deposit of marl, to obtain which, for agricultural purposes, operations on a considerable scale were undertaken by the tenant, Mr. Purves, by whom the relic of the interesting animal, found in the course of these was placed in my hands, and to whose intelligent observation I am chiefly indebted for the particulars of its discovery. In digging about twenty yards from the margin, and after penetrating a thickness of moss of about eight feet, the marl was reached, and upon its surface was found a skull in excellent preservation,* easily recognised by me, on examining it, as that of a beaver. Either no other parts of the skeleton had remained preserved in its contiguity, or they had failed to attract the attention of the workmen; the probability being, that from the slighter texture of most of the other bones, they had been less able to resist entire disintegration, or had crumbled on exposure. The remains of deer and other animals were also discovered on the surface of the marl, at about the same distance from the margin; but at other places, the horns and bones of deer, and among these a lower maxilla, were found fourteen feet beneath the marl itself, yet still within its layers, or at about an aggregate depth of twenty-two feet. Among the remains preserved and placed before me were horns of the red deer, with metatarsal bones, evidently also of animals of the deer species, all betokening individuals of once stately dimensions; while the left tibia of an ox, doubtless the *Bos primigenius*, which was found imbedded at a depth of seven feet within the marl, I computed must have belonged to an animal measuring at least six feet, or with the hoof and soft parts entire, fully half a foot more to the summit of the shoulder. The moss, at the part covering these remains, might be viewed as divided into three layers. The upper of these, approaching to about three feet in thickness, consisted of the traces of comparatively fresh vegetation: the second layer, measuring about two feet, had a less firm consistence, and changed its colour of a greenish brown, when moist and newly exposed, to almost a white when dry: the third layer extended to about four feet, but in some places to a much greater thickness, and was almost black, holding imbedded, in various grades of preservation, many and not mean remains of the primeval forests, such as trunks of trees, for the most part hazel and birch, with an intermingling of oak, some measuring from two to even four feet in

* The skull is now placed in the Museum of the Tweedside Physical and Antiquarian Society at Kelso.

diameter; and, along with these, large quantities of hazel nuts, heaped into masses, as if gathered and swept from the upper woodlands by the mountain freshets. In some places gravel was found deposited above the moss, bearing testimony to the action of similar currents.

The stratum of marl varied from two, to almost eighteen feet in thickness, and consisted of the usual fresh-water shells, but mainly of *Planorbis* and *Limnæa*; the greater part being of almost microscopic dimensions, yet often in the most entire preservation. Where the relic of the beaver had been deposited, the marl, however, to judge from portions taken from within the skull, seems to have been largely, if not entirely composed of infusoria. On the application of an acid, after a smart effervescence, with the disappearance of a considerable bulk of the material, there remained amorphous, ferruginous-like masses, and abundantly interspersed with these, the silicious coverings of the animalcules, if they be really animal organisms. Among them I distinguished *Epithemia Argus*, *sorex*, *turgida*, and *longicornis*; *Cyclotella operculata*; *Gomphonema constrictum*; *Nitzschia sigmoidea*; *Surirella craticula*; *Cymbella helvetica*; *Navicula lanceolata*; and, probably most abundant of all, *Himantidium arcus*. The remains of the mammals found in contact with the peat, including the skull of the beaver itself, were of the usual dark tint acquired from that substance: those deposited in the marl preserved more nearly their natural colour. Near the margin of the loch, and about seven feet deep in the moss, were found an arrow-head, and two or three iron horse-shoes; the latter of small dimensions. Could we regard these horse-shoes, and this individual beaver, thus found at nearly the same depth in the moss, as having, reached their position there coetaneously, as, perhaps, approximatively we may, the furthest limit to which our archæological experience would entitle us to go back for this would probably be the Anglo-Saxon period; but our surmise as to the era would still be a rude one, and within it, or even possibly long after it though scarcely before, we must be prepared to allow a wide range."

Corresponding evidence derived from a variety of sources, in like manner prove the ancient presence of the beaver in the Cambridge and Norfolk fens, and where the peat mosses of Berkshire and other English localities have accumulated for ages.

"Other discoveries, at Mundesley, Bacton, Southwold, and Happisburg in Norfolk, and at Thorpe in Suffolk, appear under relations which seem to carry the antiquity of the beaver in England farther back into the tertiary period, and ought probably to be referred to a different, yet closely allied species. In Denmark, we learn from a highly interesting communication by Professor Steenstrup,* that a lower jaw, with the greater part of the extremities of a beaver, evidently belonging to an individual animal, were discovered in the moss of Christiansholm; and that a tooth has also been found in Fyen, all the other traces hitherto of its former existence within the Danish territories having been limited to Sjælland. Specimens of stems, evidently gnawed by the beaver's teeth, were taken from Mariendals

* Oversigt over det Kgl. danske Videnskabernes Selskabs Forhandlinger, 1855, p. 381.

moss, the special locality being regarded by the Professor as probably occupying the former bed of a stream, which had been once its habitat. Similar stems, from two to four inches thick, with beaver marks, were seen in Brönsholm moss, in great quantity, and laid with remarkable regularity; while a like deposit, at a depth of about three feet, occurred in a moss near Lyngsbye. In these interesting facts, we appear to recognise distinctly the remains of the dams of the beaver, and the familiar evidences of its singular constructive faculties. Perhaps we may further refer to a period not remote from that of these relics in the mosses, the location of three beaver's teeth, in a greatly damaged condition, at the side of a human skeleton, which was found in a tomb of an ancient Lap, opened recently* at Mortensnæs, on the Varangerfjord, in the extreme north-east of Norway. A stone hammer, bearing marks of use, lay in the same grave."

The discovery of the teeth of the beaver, alongside of the rude stone hammer of a primitive Scandinavian grave is of peculiar interest to the archæologist and ethnologist, as supplying another of the many interesting examples of analogies in the resources of primeval arts. The incisor teeth of the beaver are broad, flattened, and protected in front by a coat of very hard enamel, so that in the process of wearing, they retain a sharp cutting edge like a chisel. The beaver tooth accordingly furnished to the American Indian one of his best cutting instruments, edged by a sharp and very hard enamel, previous to the introduction of iron tools. Dr. Richardson informs us, that the incisor tooth of the beaver, when fixed in a wooden handle, was used by the Indians of the North-West to cut bone, and fashion their horn-tipped spears and arrows, till it was superseded by the English file.

In Norway, the beaver is still indigenous; and indeed the extent of area which this animal still occupies in Europe, has been very imperfectly apppreciated even by the ablest of modern naturalists. From America, the European naturalist has derived his knowledge of the social habits and ingenious arts of the beaver; but careful investigation now satisfies us, that opportunities were not wanting for the study of these before America was discovered, and that such exist in Europe even at the present day. On this subject, Dr. Charles Wilson furnishes the results of extensive and careful research, accompanied with minute reference to his authorities:

"It is interesting to remark that, independent of the more remote evidence produced by Professor Steenstrup from the peat-mosses of Denmark, we have, in the testimony of Giraldus and Albertus Magnus, though not in the classical writers,

* Forhandlinger af danske Vidënskab. Selsk.: Illustreret Nyhedsblad, (Christiania, 1856), pp. 104.

proofs of an acquaintance with the gregarious habits and constructive instincts of the beaver, at a time long anterior to the discovery of America, and to the more widely diffused knowledge which followed gradually upon the narratives of the voyagers of the New Continent. It is surprising that Buffon, whose elegance of style so rarely appears as an excuse for carelessness and inerudition, should not only have overlooked this fact, but the evidence of all the more recent authorities we have quoted, as well as of others to a like purport, occurring in his own day. The beavers of Europe, says this eminent writer, never assemble in colonies, and never construct, but merely burrow; although he admits what is not nearly enough, that in Norway, and other parts of the extreme north, their huts have been reported to be found within the last centuries. Cuvier appears to have followed Buffon, in assuming that the European beavers, at least in later ages never build; and states the difficulty he has had in attempting to determine, whether those which now have their burrows along the Rhone, the Danube, the Weser, and other rivers, are originally different from the American species, or whether they are identical, and are hindered from building solely by their position in the nearer vicinity of man. While grateful that the eloquence of Buffon, and the comprehensiveness and precision of Cuvier, have given a charm and a solidity to natural history unknown to it before, it is to wonder the more that it should have been easy for us to supplement their inquiries, on this curious point, from sources so readily accessible. To approach even our own times, Bechstein, writing so recently as 1801, tells us that on the Elbe, near Kähnert, the property of the Prussian minister, Schulenberg, there were then many beavers, which constructed dams on the side channels, or arms of the river, where there was calm water. Near Wittenberg also, they lived in societies, and formed dams. In the vicinity of Hettinghausen, on the Lippe, they built their dams, and were found in considerable numbers; as well as higher up the river in the territory of Paderborn. In these localities, their constructions are stated to have been so skilful as to rival those of Canada, though the colonies were less numerous. The trees they cut down were willows and poplars. Oken mentions a beaver-hut on the Yesil, in the duchy of Cleves, which stood six feet high, with two chambers over each other, the upper having three, and the under four cells; and he refers to a paper by Meyerink, in the Berlin Natural History Transactions for 1829, describing a colony settled for upwards of a century, on the little river Nuthe, half a league above its confluence with the Elbe, in a sequestrated canton of the district of Megdeburg. In 1822, it contained from fifteen to twenty individuals: they had burrows; built huts eight or ten feet high, using trunks and branches of trees, along with earth; and constructed a dyke. Martius, writing in 1837, speaks of colonies on the Ammer, which were still tended as objects of forestry, or huntsman's craft. An authority, at the close of the last century assigns to them many localities in Germany: as in Mark, especially in the Altmark and Preignitz, and in the Middle Mark; and in the rivers Spree and Havel, in the vicinities of Berlin, Potsdam, Oranienberg, Liebenwulde, Trebbin, Nauen, and Konigshorst.

"Even close to the present day, the beaver, though scanty in its relative numbers, has a wider distribution in Europe than is usually imagined. Wagner, writing in 1846, mentions it as still not only in the Danube, but in the Amber, Isar, Iller,

and Salzach, tributaries of that river; as well as in the Elbe and Oder; while in other rivers it has only recently disappeared. In Noway, Sweden, and Poland, he reports them as in greater numbers, and as distributed over Russia. Schmarda mentions them as occurring in Transylvania; and Oken says they exist in the Traun in Austria, besides specifying for North Russia, the Dwina and Petschora. Blasius reports that a specimen was taken in Brunswick, in the Schunter, at the close of last century; but that a few years ago they were observed in the Lippe in Westphalia; and that they are still found on the Elbe, between Megdeburg and Wittenburg, though the colonies, since 1848, have been greatly reduced. He adds, that they have been recently observed in the Havel and Oder in the Altmark, in the Vistula, within East Prussia, and in Silesia; and more abundantly, in Lithuania and Poland, and in North Russia. In North-Western Germany it was found, at least formerly, in the Moselle and the Maas. Chenu mentions it as tolerably abundant in the southern part of the Rhone. They have been killed near Arles, Beaucaire, Tarascon, and even Avignon; and still subsist in such numbers as to elicit his surprise that some authors should have asserted their extinction in France. Of two which Fr. Cuvier had alive, one was from the Danube, and the other from the Gardon, in Dauphiny. In the Norwegian Pharmacopœia of 1854, the Norwegian castoreum holds its place beside that of Russia and of Canada. Wylie, in the Russian Military Pharmacopœia, mentions the animal as common in Russia and Siberia, and more rare in Livonia and Poland. In South Russia, Demidoff says that they are somewhat scarce on the Danube, but that they are more common in the region towards the Caucasus, and that many have been recently killed in the districts watered by the Natanebi and the Tereck. To the river habitats already noted, Moleschott adds the Inn, the Lech, the Upper Rhine, the Weser and the Bug, as each still presenting rare examples. Upon the whole, the beaver still appears to be encountered, seldom or never plentifully, always in greatly diminished numbers, and generally with an extreme and constantly increasing rarity, in the Austrian and Prussian States, Bavaria, Russia, Sweden, Norway, Lapland, France, and perhaps Switzerland.

In ancient as in modern times the beaver was applied to the same uses, for dress, for the table, and for medicinal purposes; and from all of these we derive interesting traces of the presence of this animal in ancient historic localities. We learn from Herodotus, that the Budini employed the fur of the beaver as a trimming for their cloaks; and from ancient laws and local charters, fixing the duties on exports, we are supplied with indications of its use at various times for similar purposes. In the Welsh code of Hywel Dda, circa A. D. 900, the *Llosdlydan*, or beaver, is valued at 120 pence. In the *Leges Burgorum* instituted by David I. of Scotland, circa A. D. 1150, fixing the rate of custom duties on "*Peloure*,"—or peltries, as we now call them,—beavers' skins are mentioned along with those of the fox, the weasel, the martin, the wild cat, the ferret, &c., each being charged at

their "outpassing," or export, fourpence "ilk tymmyr," *i. e.* so many as are inclosed or packed between two boards of timber, usually amounting to forty skins.* This Scottish code is copied nearly verbatim from the laws and customs instituted for Newcastle-upon-Tyne, by Henry I. and confirmed by subsequent royal charters; and among the exports from the Tyne, are specified the skins of foxes, martins, sables, beavers, goats and squirrels.† Thus we perceive that the beaver was known in Wales in the tenth century, and its skins were objects of export both in Scotland and England, at least till the middle of the twelfth century. In further illustration of the existence of the Welsh beaver, Dr. Charles Wilson remarks: "Silvester Giraldus, travelling in this country in 1188 with Archbishop Baldwin of Canterbury, who preached there that crusade in which he afterwards followed Richard Cœur de Lion to the Holy Land, and perished at Acre, tells us, in speaking of the river Teivi, that it retained a special notability: 'inter universos namque Cambriæ seu etiam Loegriæ fluvios, solus hic castores habet.' He then proceeds to give an account of the habitat of the animal, at some deep and still recess of the stream; describes its dams and huts and its methods of construction, with considerable minuteness; and records the dangers to which it is liable on the score of its skin, which is coveted in the west, and the medicinal part of the body, coveted in the east; while he adds, with evident scruples as to the orthodoxy of the practice, that in Germany and the northern regions, great and religious persons, 'tempore jejuniorum,' eat the tail of the fish-like creature, as having both the taste and colour of fish:" a practise, which, it will be seen has been transferred, with the races and medieval creed of Europe, to the New World.

To those illustrations of the varied evidence by which the presence of the beaver is traced in Britain from the remotest period, down, at least, to the twelfth century, may be added others of a diverse character, borrowed from different, yet not less interesting and trustworthy sources than those hitherto referred to, viz.: the pages of our elder poets. They serve at least to show the familiar occurrence of the name of the beaver, in the traditional illustrations belonging to the reigns of Richard II. and the Fourth and Fifth Henries of England, with the contemporary Scottish sovereigns; nd to confirm the evidence derived from other sources, of the probable existence of

* Jamieson's Scottish Dictionary, v. *Timmer*.

† Archæological Institute, Newcastle. Memoirs of Northumberland, vol. I. p. 27.

the beaver in the remoter districts of Scotland, England, and Wales, long after it had ceased, from its diminished numbers to be an object of legal or commercial consideration.

The first of these occurs in "Pier's Ploughman's Creed," a poem written by a Wycliffite of the reign of Richard II. and abounding in satirical allusions to the excesses of the clergy. Here he describes the Franciscan, with more cloth in his cape than furnished St. Francis with a frock; and yet underneath this, he wears a coat lined with the fur of the weasel or fitchet, or of the *fine beaver*:

"Loke hough this loresmen
Lordes betrayen,
Seyn that they folwen
Fully Fraunceyses rewle,
That in cotinge of his cope
Is more cloth y-folden
Than was in Frannceis froc
Whan he hem first made.
And yet under that cope
A cote hathe he furred
With foyns, or with fichewes,
Other fyn bevere."

In the Act of the first Parliament of James I. of Scotland, held at Perth, in 1424, regulating the "Custome of Mertrik skinnes, and uther furringes," the martin, pole-cat, fox, otter, and other skins, have their export duties specified; but the beaver, which figured among the Scottish exports in the reign of David I. no longer appears. Yet an interesting piece of evidence of the most authentic kind, proves that the beaver was not unknown to King James; although it had ceased to be a subject of Scottish taxation, and even perhaps no longer continued to form an object of the chase. In his beautiful poem of the King's Quair, written during his detention at the English Court, prior to 1423, after describing his interview with "Dame Minerve," and the good counsel he received, he relates his wandering

"Along a river, pleasant to behold,
Enbroudin all with fresché flourys gay,
Where through the gravel bright as any gold,
The crystal water ran so clear and cold,
That in mine ear it made continually
A maner sound, mellit with harmony.

Of bestis saw I many dyvers kind:
* * * * * *
The bugill drawer by his hornis great,
The martrik sable, the foynze, and many mo,
The chalk-white ermine tipped as the jet,

The royal hart, the conyng, and the roe,
The wolf that of the murder not say ho,
The lusty beaver, and the ravin bear,
For camelot the camel full of hair."*

It is to be observed, that in this enumeration of the royal poet, he does not confine himself exclusively to native animals, and this is still more the case in previous stanzas, where not only the tiger, dromedary, and elephant, are named, but even the unicorn:

"That voidis venom with his ivory horn,"

Nevertheless, the mention of the lusty beaver among the other animals enumerated, sufficiently shows that it was not altogether unfamiliar then, although its name disappears in this reign, from the official lists of taxable exports. It probably did not become entirely extinct for a considerable period thereafter.

Reference has already been made to the curious account of the habits of the beaver, as witnessed by Giraldus Cambrensis in the Welsh river Teivi, in 1188; and Drayton revived the story in the early part of the 17th century, in his "Poly-Olbion," where in the sixth song, he thus embodies old marvels, and "tells what rare things Tivy breeds:"

"More famous long agone, than for the salmon's leap,
For bevers Tivy was, in her strong banks that bred,
Which else no other brook of Britain nourished;
Where Nature, in the shape of this now perished beast,
His property did seem t' have wondrously express'd;
Being body'd like a boat, with such a mighty tail
As served him for a bridge, a helm, or for a sail,
When kind did him command the architect to play,
That his strong castle built of branched twigs and clay:
Which, set upon the deep, but yet not fixed there,
He easily could remove as it he pleas'd to steer
To this side or to that; the workmanship so rare,
His stuff wherewith to build, first being to prepare,
A foraging he goes, to groves or bushes nigh,
And with his teeth cuts down his timber; which laid by,
He turns him on his back, his belly laid abroad,
When, with what he hath got, the other do him load;
Till lastly, by the weight, his burden he have found,
Then with his mighty tail his carriage having bound
As carters do with ropes, in his sharp teeth he grip'd
Some stronger stick; from which the lesser branches stript,
Hé takes it in the midst; at both the ends the rest
Hard holding with their fangs, unto the labour prest,
Going backward tow'rds their home their loaded carriage led,
From whom, those first here born, were taught the useful sled.

* The *bugill;* the bullock or ox. *Martrik sable;* the sable martin. *Foynse;* the pole-cat.

> Then builded he his fort for strong and several fights;
> His passages contriv'd with such unusual sleights,
> That from the hunter oft he issu'd undiscern'd,
> As if men from this beast to fortify had learned;
> Whose kind, in her decay'd, is to this isle unknown,
> Thus Tivy boasts this beast peculiarly her own."

So also Browne, in the fourth song of his "Brittannia's Pastorals," representing the consolation of the bereaved Pan, in the memorial tree that sprung

> "Out of the maiden's bed of endless rest,"

introduces Tivy's beavers, as familiar objects of dread to the guardian of the sylvan shades:

> "The many-kernel-bearing pyne of late,
> From all trees else, to me was consecrate;
> But new behold a roote worth more my love,
> Equal to that which, in an obscure grove,
> Infernal Juno proper takes to her.
> * * * * * *
> This must I succour, this must I defend,
> And from the wild boar's rooting ever shend;
> Here shall the wood-pecker no entrance finde,
> Nor Tivy's bevers gnaw the clothing rinde."

By means of such passages from the elder British poets, we trace the memory of the native beaver, and the popular traditions associated with it, down to a period when the study of the strange habits of this remarkable animal was revived amid its populous haunts in the New World. Then the marvels of the hunter and the traveller effaced the memory of older home traditions, and to this source we may trace the flattering comparison instituted by Gibbon, in the forty-second chapter of his "Decline and Fall of the Roman Empire," between the settled, domestic beaver, and the nomad Tartar hordes of Asia: "They were bold and dexterous archers, who drank the milk, and feasted on the flesh of their fleet and indefatigable horses. Their huts were hastily built of rough timber, and we may not without flattery compare them to the architecture of the beaver, which they resembled in a double issue to the land and water for the escape of the savage inhabitant: an animal less cleanly, less diligent, less social, than that marvellous quadruped."

The hunting of the beaver, appears to have been anciently a favourite sport on the continent, if not in England; though the zeal with which the otter is still pursued in Scotland may suggest the older beaver huntas not improbably one of the ancient sports of that country. The

convenient medieval creed, which converted the amphibious rodent into a suitable lenten dish, when flesh was forbidden, no doubt added to the zeal with which the beaver hunt was pursued, and contributed to hasten its extinction, as it is likely to do in our own Canadian province, where the luxurious *bon bouche* of beaver's tail is recognised and sanctioned by the supreme ecclesiastieal authorities of the Roman Catholic Church, as *maigre,* or Lenten fare. On this part of the subject I am informed, on the authority of one of the resident clergy of Lower Canada, that according to the discipline of the Roman Catholic Church the flesh of all amphibious animals is classed in the same category with that of fishes, and as such is allowed to be eaten during Lent and on other days of abstinence from flesh-meat. In this way the flesh of tortoises, frogs, and seals is considered to be meagre, and even certain wild ducks, more than ordinarily aquatic in their habits, enjoy the same distinction.

After the discovery of Canada, the Jesuit Missionaries demanded of the Holy See, whether the beaver might not be ranged in the same category, and from the descriptions sent home by the Reverend Fathers, the beaver was regarded as amphibious, and as such, allowed to be eaten as meagre diet.

It is not the tail only, so far as I can learn, but the whole of the carcase which is *maigre*; though on this point I have received contradictory opinions. The musk-rat is also meagre food, but not the otter; a distinction which, in the absence of any assigned reason seems singularly arbitrary. References to the beaver frequently occur in the journals of the French Missionaries of the seventeenth and eighteenth centuries, but in very many respects these earlier descriptions of this animal are very incorrect, and mingled with fable. A curious and elaborate memoir upon the subject, prepared by Michel Sarrazin, is to be found in the Memoirs of the Academy of Sciences of Paris.

This source of the continued estimation of the beaver, apart from its fur or castoreum, whereby it contributes some variety to the canonical fast-day dietetics by right of its aquatic habits; and in virtue of which, its tail--though so rich as to tax the skill of the cook in its preparation for the table,—is authoratatively prescribed as meagre diet: is no modern novelty of the Canadian church. Dr. Charles Wilson notes various proofs of the value attached to the beaver, especially by ecclesiastics, in ancient times, on account of its having furnished an agreeable variety to the fare prescribed for their fasts and self-denying observances.

"In a German charter dated in 1103, the right of hunting beavers is conferred along with other huntings and fishings; and a Bull of Pope Lucius III., in the year 1182, bestows upon a monastery the property in the beavers within their bounds. In comparatively recent times, Mylius cites a Prussian royal edict, regarding the beaver in the Elbe, dated 20th January 1714; with a subsequent one, insisting upon its protection under a penalty of no less than 200 dollars, issued at Berlin on the 24th March 1725. It was doubtless under a similar policy, that Frederick II. is reported to have gathered together a large colony of beavers, that he might turn them to economic uses: but with so little success, says Zimmermann, that they became afterwards dispersed throughout Brandenburg, and were soon rarely encountered.

Streso, a Dutch writer, states that the animal was used as food in Holland, in the time of the Crusades; and he repeats the common notice, that its tail and paws were eaten as fish, with a safe conscience, during the religious fasts. But the monks of a convent of Chartreux, at Villeneuve-les-Avignon, seem to have carried this indulgent notion farther, and to have accounted their entire carcass among the '*mets maigres;*' preparing from it large quantities of sausages, which were sold, and highly prized in the adjoining country. Albertus Magnus, however, says that their whole flesh was abominable, except the tail. Gesner describes the mode in which it was rendered savoury by the Swiss, he himself relishing the choicer portions as sweet and tender, 'jure croceo conditos.' Belon also tells us that its tail, which, he says, sometimes weighs four lbs., was in his day used in Lorraine during Lent, and accounted a great delicacy, having a close resemblance in flavour to a nicely-dressed eel. The northern nations, according to Olaus Magnus, agreed with he rest in considering the tail and paws as highly delicate morsels."

We thus recognise in the beaver, which has disappeared within recent generations from so many of its Canadian haunts, and now lingers in greatly diminished numbers only in the least accessible waters, the survivor of a species familiar to man in remote centuries, rendered popular in the fables of Æsop, and noted by Herodotus, Hippocrates, Pliny, and Strabo. The last relics of the extinct Dodo have acquired a value the living animal never could have possessed; and the same reasons that confer an interest on the evidences of the extinction of species, as illustrating the like process still going on which geology reveals in the whole past economy of life, render the beaver of the Old and the New World worthy of special notice, as destined seemingly, like the Aboriginal Indian of this continent, to pass away from the records of living nature.

CAPTURE OF TWO BIRDS OF UNUSUAL OCCURRENCE, IN UPPER CANADA.

BY T. J. COTTLE, F.R.C.S.E.

Read before the Canadian Institute, March 5th, 1859.

PICUS (DENDROCOPUS: SWAINSON) MERIDIONALIS. LITTLE GEORGIAN WOODPECKER.

Swainson, in a note in the *Fauna Boreali Americana*, under the above name, thus describes a bird, which he suggests might be found occasionally in the northern parts of America:

"Woodpecker, varied with black and white; crown, black; a broad red band on the hind head; second quill equal to the eighth; smaller than *Picus pubescens*, which it resembles in general appearance and rounded form of the tail feathers. The under plumage, however, is hair brown (as dark, but not as yellow as that of *P. major*) instead of white, or whitish, as in *P. pubescens*. The red band is much broader, and the relative length of quill is different. Inhabits Georgia. As we have seen as yet but two specimens of this, we consider its claims require further confirmation."

In September, 1854, I shot a bird, which I think agrees with the above; and as I can find no description corresponding to it in either Wilson or Audubon, it may be worth while laying it before the members of the Canadian Institute, for their opinion.

I send a rough sketch of my bird, which may serve to show the peculiarities in the marking. It differs so much from *P. pubescens* as to preclude any idea of its being a variety. In addition to Swainson's description, I would give the following: Length, six inches. In my specimen, which I suspect to be a young one of the year, the forehead is black, intermixed with rufous; towards the occiput, the red predominates, but is spotted with black. I have no doubt but that in the next moult it would answer the Swainson description. From the bill, passing over the eye and round the head, is a band of dirty white; under this, passing through the eye, is another of black—below which, one of light rufous shading, with dirty white, runs round the lower part of the neck, nearly to the centre, where it is separated from that on the other side by black. The whole of the under parts are of a hair brown. The lateral tail feathers are cinna-

mon brown, crossed by two black bars. The black and white workings on the wings and back closely resemble those of the *P. pubescens*, except that in the latter bird the white is purer.

A comparison of the more prominent differences between *P. meridionalis* and *P. pubescens :*

P. MERIDIONALIS.

Length, six inches; under parts, hair brown; lateral tail feathers, cinnamon brown, with two black bars; red of head, above the white band which reaches to the bill.

P. PUBESCENS.

Length, six inches and three-quarters; under parts white; lateral tail feathers white, with two black bars; red of head below white band, which does not reach to bill

Swainson gives the habitat of *P. meridionalis* as Georgia. I can hardly think so, for Audubon searched that State, and he does not record the bird. It may more probably be Mexico, but if so, it is a long journey for a young bird to Canada.

The other bird I wish to record is the Ortygometra (*Rallus. L.*) Jamaiciencis, a specimen of which was procured near Ingersoll, I believe, in 1857, and is now in the collection of Wm. Poole, Esq. Audubon figures it in his Synopsis, Plate cccxlix., and thus describes it: "Head and lower parts, dark purplish grey, approaching to black; the sides and lower wing coverts and abdomen barred with greyish white; hind head and fore part of back dark chestnut; the rest of the upper parts greyish black, tinged with brown, and transversely barred with white; wings inclining to reddish brown. From Louisiana to New Jersey: migratory."

COMPARATIVE TABULAR METEOROLOGICAL OBSERVATIONS IN CANADA, ENGLAND AND RUSSIA.

BY W. GRÆME TOMKINS, C.E., P.L.S.

Read before the Canadian Institute, 22nd February, 1859.

The very able and valuable observations, on the meteorological phenomena of Toronto, carried on in the Provincial Observatory under Professor Kingston, have prompted me to join my feeble endeavours in

such investigations, in this more elevated portion of the province; and having now completed one year's observations, I have prepared the same for presentation to the Canadian Institute, hoping the information they may afford will not be considered unworthy of its attention.

The position of St. Mary's in the county of Perth, Canada West, is in latitude 43° 17′ 57″.6 north, and longitude 81° 13′ 30″ west of Greenwich, and its elevation above Toronto (lake Ontario) is, by the Grand Trunk Railway levels 833.41 feet, to which must be added 24 feet the elevation of my place of observation above the railway, making 855 feet above Toronto; and allowing the Lake Ontario, to be 235 feet above the level of the ocean, (the usual quantity allowed) this will give St. Mary's a total elevation of 1090 feet above the ocean. It may be well to remark here that it is about 30 miles west of the highest ridge levels of the province, which ridge runs from Berlin, county of Waterloo, to Woodstock, county of Oxford, and the height of this ridge may be counted about 150 feet above St. Mary's.

The observations have been taken with the greatest care, and read off and registered every morning at 8 a. m., which is given by Professor Airy as the best mean time for barometric and thermometric data. The quantity of rain fall or melted snow is taken in a large rain guage of nearly one foot in diameter, and the direction of the wind is given as the prevailing one of the preceeding 24 hours, as also the general atmospheric appearance.

To render the observations more interesting from St. Mary's, I have added comparative tables taken from authentic sources, and my own experience. Those from Toronto are from the published papers of the Canadian Institute, and therefore perfectly reliable. I may here call attention to the fact that Toronto is in north latitudė 43° 39.4′, and west longitude 79° 23.2′.

The observations in London (England) are from papers read before the Royal Society, by the late professor Daniell, my respected chemical preceptor in King's College, London, and are received as the best extant.

The St. Petersburgh observations are taken out and reduced from the Imperial Russian Almanac, published by authority of government, and under the ablest professors of that capital. And, the Moscow tables are from my own observations during several years' residence in that city.

The latitude of St. Petersburg is 59° 56′ north and longitude 30°

19′ east of Greenwich. Moscow is situated in latitude 55° 46′ north and longitude 37° 36′ east, the former is about 21 feet above the level of the Neva or Baltic sea, and the latter is by the levels of the St. Petersburg and Moscow Railway about 650 feet above the Baltic sea, and is situated 460 miles in the interior, and away from any large body of water.

The tables will better speak in detail for themselves, but in a general way a few remarks may be made on them as follows. In the barometric table it is very remarkable that the rise and fall of each month is the same in each of six cases although not actually equal, indicating some general law of atmospheric density in this northern hemisphere. Thus the highest month is different as well as the lowest, but the difference is slight.

	Highest.	Lowest.
St. Mary's,	July,	March,
Toronto,	June,	March,
Hamilton,	September,	November,
London, (England),	February,	August,
St. Petersburgh,	May,	February,
Moscow,	July,	June.

The differences of the elevations will, of course, account for the varied means, or heights in inches which may be briefly recounted thus:

Place of observation.	Above Ocean level.	Bar. height.
St. Petersburgh,	40 feet	29.955 inches.
London, (England,)	80 "	29.885 "
Toronto,	235 "	29.617 "
Hamilton,	240 "	29.681 "
Moscow, (Russia,)	650 "	29.539 "
St. Mary's, (C. W.)	1090 "	28.842 "

NOTE.—These heights take in the buildings as well as the level of the land given before. The barometric heights are modified by local circumstances.

The thermometric tables will be found of considerable interest, from the comparative results of the different months, and the annual means of the various places indicated in Europe and America. By it, it will be seen that St. Mary's is a little the warmest in summer, being in July 74°.81, and Moscow, (Russia,) the coldest in February 7°.30, both measured by Fahrenheit thermometer, and it is the same one employed in both cases, being a standard thermometer prepared by Tagliabera of

London in 1842, of the greatest exactness, and compared by myself with the standard thermometer of the Royal Astronomical Society of London. A short table for the isothermal lines from these data may thus be stated:

	North. Lat.	Warmest Month.	Mean Temp.	Coldest Month.	Mean Temp.	Difference.
Hamilton	43° 15.3	July	73.26	January	27.57	45.63
St. Marys	43 17.9	"	74.81	February	21.58	53.33
Toronto	43 39.4	"	67.03	"	22.98	44.05
London, (England)	51 30.0	August	61.30	January	36.10	35.20
Moscow, (Russia)	55 46.0	July	70.25	"	7.30	62.95
St. Petersburg, (Russia)	59 56.0	"	61.50	"	8.94	52.56

From which it appears by these tables that the greatest change of temperature on the continent of Europe takes place in Moscow, and the greatest in Canada, in St. Mary's, the relative difference being noted above.

The table of rain or melted snow, is also of considerable interest, shewing the amount which our streams and rivers have to carry off.

The annual sums point out that the Peninsula of Canada being surrounded on all sides by lakes or large deposits of water, the air becomes greatly saturated with moisture, which falls upon, and fertilises our fields and lands, and that Toronto is the greatest recipient of such fall being 37.16 inches; St. Mary's, the second, 35.42; Woodstock, 34.45, and London, in England, 24.26 inches. The amount at St. Petersburgh is very small, and as we know it to be in high northern latitudes, viz: 16.49 inches.

This table for St. Mary's being for only one year will have to be corrected by future observations, which I am making daily, and shall transmit to the Institute as soon as completed, if deemed of sufficient value.

The table of atmospheric phenomena for the year 1858 in St. Mary's, shews in a forcible manner the genial nature of the climate in this part of the province. We have by these tables following, 42 per cent. fine, clear days, and very nearly 24 per cent. changeable and cloudy days, as also 19 per cent. quite dull, cloudy days, and only 15 per cent. absolutely snowy or rainy days, this must be admitted to be a very favourable view meteorologically of our Canadian climate.

The direction of our air currents is also of great importance for this elevated part of the Province, and the observations shew, that the great majority of them are from the westward, being 38 per cent. on

the year, 24 per cent. from the north, 20 per cent. from the south, and 18 per cent. from the east.

In conclusion, I have to regret the absence of other important points, owing to the want of instruments, viz: the position of the dew point, the greatest extremes of heat and cold by a registering thermometer, and the force or velocity of the air currents; all of which I greatly desire to add to render my observations more perfect, but being at present unprovided with the necessary instruments, I must therefore apologize for what I am aware are great defects, and submit the tables to the Institution in the best form I can offer them.

METEOROLOGICAL OBSERVATIONS AT ST. MARY'S FOR 1858.

BY W. G. T.

DIRECTION OF WIND.

TABLE shewing the number of days that the winds from the four chief points prevailed in each month.

Month.		West.	East.	North.	South.	Days.
Winter.	December	7	7	5	12	31
	January	10	8	5	8	31
	February	11	7	6	4	28
Spring.	March	21	3	3	5	31
	April	9	11	4	6	30
	May	8	15	2	6	31
Summer.	June	20	0	8	4	30
	July	13	4	13	1	31
	August	12	6	9	4	31
Autumn.	September	10	2	11	7	30
	October	11	3	7	10	31
	November	7	9	16	0	30
Sum of direction.		139	75	88	67	365

Or from Westward, 38 per cent.
" Eastward, 20 "
" Northward, 25 "
" Southward, 18 "

100

METEOROLOGICAL OBSERVATIONS AT ST. MARY'S FOR 1858.

BY W. G. T.

ATMOSPHERIC APPEARANCE.

Month.		Fine.	Change.	Dull.	Rain.	Days.
Winter.	December	10	10	7	4	31
	January	10	12	5	4	31
	February	7	7	7	7	28
Spring.	March	15	9	4	3	31
	April	10	9	4	7	30
	May	11	8	6	6	31
Summer.	June	21	4	3	2	30
	July	20	5	4	2	31
	August	16	7	3	5	31
Autumn.	September	18	5	5	2	30
	October	14	5	7	5	31
	November	6	6	10	8	30
Annual sum, number of days.		158	87	65	55	365

Or 42 per cent., fine, bright, clear.
24 " changeable, showers, cloudy.
19 " dull, overcast.
15 " rainy or snowy days.
100

THERMOMETRIC COMPARATIVE TABULAR RESULT OE ANNUAL METEOROLOGICAL OBSERVATIONS IN CANADA, ENGLAND AND RUSSIA.

Month.		St. Mary's, 1858.	Toronto, Mean, 20 years.	Hamilton, Mean, 8 y.	London, (England,) 20 years.	St. Petersburg, (Russia.)	Moscow, (Russia.)
Winter.	December	30.40	26.35	31.25	39.90	17.78	7.55
	January	31.00	23.22	27.57	36.10	8.94	7.30
	February	21.58	22.98	27.77	38.00	19.76	22.10
Spring.	March	29.71	29.82	35.02	43.90	22.44	18.57
	April	46.40	41.06	44.16	49.90	33.50	46.02
	May	50.55	51.37	56.33	54.00	46.74	59.00
Summer.	June	74.53	61.16	70.77	58.70	53.18	62.53
	July	74.81	67.03	73.26	61.00	61.50	70.25
	August	71.74	66.02	70.56	61.30	60.62	60.80
Autumn.	September	63.70	58.07	62.35	57.80	50.38	39.40
	October	50.30	45.20	49.82	48.90	39.36	29.83
	November	34.00	36.62	37.95	42.90	33.13	17.60
Annual Mean.		48.23	44.07	48.91	49.36	37.27	36.75

BAROMETRIC COMPARATIVE TABULAR RESULT OF ANNUAL METEOROLOGICAL OBSERVATIONS IN CANADA, ENGLAND AND RUSSIA.

	Month.	St. Mary's, 1858.	Toronto, Mean, 20 y.	Hamilton, Mean, 8 y.	London, (England,) 20 years.	St. Petersburgh, (Russia.)	Moscow, (Russia.)
Winter.	December...	28.803	29.590	29.670	29.770	30.210	29.187
	January ...	28.931	29.710	29.710	29.920	29.696	29.697
	February ...	28.751	29.580	29.676	30.070	29.695	29.131
Spring.	March	28.710	29.553	29.651	29.834	29.895	29.731
	April	28.725	29.569	29.661	29.881	30.123	29.580
	May	28.812	29.598	29.657	29.898	30.164	29.364
Summer.	June	28.908	29.617	29.676	30.020	29.740	29.058
	July	28.951	29.665	29.700	29.870	29.981	29.757
	August	28.910	29.590	29.724	29.750	29.893	29.698
Autumn.	September..	28.925	29.646	29.760	29.931	30.085	29.893
	October......	28.904	29.664	29.666	29.900	29.942	29.871
	November...	28.778	29.626	29.637	29.776	30.041	29.498
Mean, year.		28.842	29.617	29.682	29.885	29.955	29.539

MEM.—Remarkable coincidence in mensual rise and fall in nearly all cases.

RAIN OR SNOW, (MELTED) IN INCHES.

COMPARATIVE TABULAR RESULT OF ANNUAL METEOROLOGICAL OBSERVATIONS IN CANADA, ENGLAND AND RUSSIA.

	Month.	St, Mary's, 1858.	Toronto. 18 years.	London, (England,) 20 years.	St. Petersburg, 10 years.	Woodstock, C.W. 1854.
Winter.	December	3.29	3.040	2.40	0.64	1.56
	January	2.29	2.896	2.48	2.34	2.81
	February......................	2.05	2.866	0.75	0.65	1.78
Spring.	March	2.38	2.483	1.44	0.90	2.18
	April............................	2.42	2.799	1.79	0.55	1.40
	May	5.93	3.137	1.85	0.75	1.71
Summer.	June...........................	7·38	3.163	1.83	1.86	5.07
	July	1.24	3.562	2.52	1.84	4.06
	August........................	2.37	2.807	2.54	1.11	3.80
Autumn.	September	1.34	4.333	2.19	2.35	4.21
	October	1.61	2.803	2.07	2.15	3.86
	November	2.92	3.268	2.40	1.35	2.01
Annual sum, inches.		35.42	37.157	24.26	16.49	34.45

W. GRÆME TOMKINS, C.E., P.L.S., &c.

St. Mary's, January, 1859.

THE SENSATIONALIST PHILOSOPHY.

BY REV. WILLIAM HINCKS, F.L.S.,
PROFESSOR OF NATURAL HISTORY, UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, 22nd February, 1859.

I am almost afraid that this paper may bring some discredit on our society, as it will be a subject of wondering inquiry, in what remote corner of the globe, in what peculiarly unenlightened region, the man is to be found who is willing to avow himself a Sensationalist, undeterred both by the general opinion of those at present most engaged in these studies, and by the anything but complimentary epithets with which his system and its advocates have been assailed, not merely by special opponents but even by those who assume the character of calm and impartial historians. I can only account for my obtuseness by observing that I am by no means a young man, that at the distant period when I entered with ardour on the study of the human mind, the Sensationalist philosophy stood well in public estimation, and was powerfully defended by men of acknowledged talents. After much reading, study and reflection I formed my opinions, and having done so I cannot change with changing fashions, see with new eyes, or even patiently sit down under the rebukes and imputations of any one who has himself drank from German fountains, and believes all wisdom to be with his masters. I may not hope in the present state of things to produce conviction in others, but I may perhaps claim to have the opportunity of expressing my views in a form which shall, at least, be free from the perversions of adversaries, and of openly refusing my assent to the prevalent dogmas, however weighty the names by which they are sanctioned. As this short paper relates to a subject upon which one interested in it might easily write a volume, upon which indeed I feel that a volume must be a large one to give space for doing justice to the discussion, I must begin by apologizing for offering so slight an attempt at the treatment of a great question, whilst at the same time I feel myself to be in danger of trying the patience of many who have not given attention to these pursuits, or to whatever degree they have done so, have been carried in the very contrary direction to that in which I persevere in working my way, and may therefore be

little prepared to appreciate what I shall offer. It is a sense of the injustice with which those who hold my views have been treated, that induces me to say something in their defence, although I must candidly confess that my philosophical reading is not quite up to the times, and that my attention has of late years been much diverted to other subjects. If, however, I should feel incompetent to discuss with you the various modifications of German Idealism, and to manage with ease its peculiar phraseology, I believe that I do understand what was really meant by the leading writers of the school, for which I shall accept Mr. Morell's name: *Sensationalist*, and that I know what inferences from their doctrines they who had carefully studied it admitted. When therefore I see these things totally misrepresented by popular authorities I feel entitled to offer a few words of explanation.

The philosophical system, now called Sensationalism, is regarded by its supporters as being no more than the fair carrying out of Mr. Locke's principles. Bishop Law prepared the way for it, whilst the philosophic physician, David Hartley, fully developed it and set it forth as a finished work, complete in all its parts, and even exhibited in its application to the conduct of life. Dr. Priestley perceived that Hartley's account of the physical cause of sensations and their corresponding ideas was misunderstood by many, and disapproved by others to a degree that made it an impediment to the fair consideration of his great doctrine of the association of ideas, and thence was induced to publish what related to the latter in a separate form, with some illustrative dissertations of his own, and in other works he defended in connection with Hartley's theory a peculiar modification of materialism. The speculations of Darwin went to such an extreme, and were so generally thought both false and pernicious as to bring no small odium on the whole system with which his extravagances seemed to be connected. For a time Sensationalism languished, cherished indeed by some learned and thoughtful men, but neglected by the crowd, and doing little to defend itself against adversaries or conciliate public approbation. At length Dr. Brown arose, belonging indeed to the Scotch idealist school,—of which Reid and Stewart were principal ornaments,—but adopting the great law of association, and in his various ingenious analyses of mental states manifestly following the method of the Sensationalists, whilst he rejected the name by which Hartley had expressed his theory, and pursued with ridicule and scorn the

physical part of it, as if hoping thus to conceal his extensive obligations to this great philosopher, or rather perhaps to avoid the imputation of any connection with a system unpopular in his country, and long denounced in the scene of his public teaching. I know of no ground for preferring the term *suggestion*, employed by Brown to *association*, the older name; the distinction between *simple* and *relative* suggestion does not appear to be founded on any essential difference or to be practically useful, and the laws of suggestion were soon shown to be reducible to much greater simplicity. Yet Dr. Brown appreciated and exhibited in a peculiarly pleasing manner some great truths, and displayed a power of thought joined with ingenuity and sagacity which command admiration. He has fallen under the imputation of inclination towards Sensationalism, and he is one whose aid, as far as it goes, any party might be proud of. Not to dwell on writers of secondary importance, we come next to JAMES MILL, one of the clearest of writers and closest of reasoners. He put aside, as not immediately needed, all inquiry respecting the physical cause of sensations and their physical relations with ideas, in which respect his judgment may be called in question; but beginning where he did, his work is a noble contribution to philosophy. He fully adopts the Hartleyan doctrine of association, and by simple and well chosen terminology, clearness of style, vividness of illustration, and a lucid order in his thoughts he has rendered the theory intelligible and interesting, whilst his admirable original views respecting language, and his beautiful analysis of some of the most complex ideas conveyed by it have thrown a new and bright light on the whole subject. I cannot feel satisfied with his account any more than with Hartley's, of the emotional part of our nature, to explain which, something more than he admits seems to be required, and I have a method of my own for endeavouring to complete in this respect the theory of the mind, but Mr. Mill's work seems to me, entitled to a place among the finest that have been produced on the philosophy of mind, and deserving of far more attention than has yet been bestowed upon it.

I need not here dwell on the abuses of sensationalism in France, or on the peculiar forms which it assumed in the hands of Helvetius, Condillac, Cabanis, and De Stutt de Tracey; the last mentioned beyond comparison, the best French writer of this school. I cannot but think the phraseology of Condillac more objectionable than what I take to be his real meaning. The Ideologie of De Stutt de Tracey, is both in-

teresting and instructive, and seems to me worth many volumes of the French school which has succeeded him.

The Germans have added nothing to the literature of Sensationalism which is too much opposed to their mystical tendencies ever to have secured any portion of their favour.

Let me now endeavour to explain the connection of the Sensationalist doctrine with Locke's philosophy, which you must be aware does not directly favour it. Locke rejected innate ideas, maintained that the first and the simplest mental states are sensations, and that from them as materials, the mind forms all its other states. The question arises, and may appear not to have been satisfactorily answered by Locke himself, *how* these other states, by him called ideas of reflection, are formed. We all recognise certain remnant copies or revivals of sensations recurring singly or in clusters, as the case may be, differing sufficiently from the actual sensations, yet irresistibly referred to them, as specially connected with them, and implying their previous existence. The inquirer asks, do these, variously combining together according to natural laws, produce all possible mental states; or are they altered by an action upon them of certain faculties inherent in the mind; or again, are they so altered and acted upon after being united with other states necessarily existing, though only made perceptible by such union and which thus constitute an equivalent of the supposed innate ideas? I know not that any other supposition than these three is possible in connection with Mr. Locke's primary principles. The latter must be adopted by the pure idealist if he at all followed out Mr. Locke's course of thought or admitted the first principles. The second was probably Locke's own view, but could not be sustained, if the first and simple supposition explains all the phenomena, or if the alleged faculties are shown by analysis to be mere cases of a general law. The first supposition is that adopted by the Sensationalist, who maintains that assuming only the uniform operation of certain very simple laws derived from a wide induction and shown to have at least a probable connection with the physical cause of sensations, he can show how all possible mental states, intellectual and emotional must arise from sensations and their revivals above referred to. He offers proof that what are described by writers of other schools as distinct faculties of mind are only cases of the results of the great laws, not at all requiring any supposition of distinct powers, and he undertakes to exhibit the composition and gradual formation of those very ideas,

in his view highly complex, which are usually referred to as examples of ideas incapable of being analysed, which must therefore have a necessary origin in the mind. For myself, I will only now say on this subject, that if any one capable of reasoning on such matters, and at all prepared by previous inquiries, can read Dr. Law's notes on the ideas of space, time, immensity, and eternity, in his celebrated edition of Archbishop King's origin of evil, and afterwards study James Mill's clear and masterly analysis of what is implied in these terms and still maintain that they represent simple ideas inherent in the mind and independent of external things; he and I differ so fundamentally and approach these inquiries from such different points that I know not where to seek any common ground, so as to see where our differences begin, or how they are to be settled.

Proceeding on what seemed to me the plainest possible principles, and unwilling to break the continuity of my reasoning I stated the relation of the ideas corresponding to sensations to the sensations themselves, as implying their previous existence, as something certain and generally admitted. I do not wish however to overlook the fact, that manifest and indisputable as this appears to my mind, and generally as it seems to be received as among the most certain truths, it is denied by those who have made a certain progress in the German idealist school of philosophy. As an example I refer to a man of great powers and great attainments, as well as of conspicuous position in the world of science, Dr. Whewell, of Cambridge, in his 'Philosophy of the inductive Sciences,' a work containing so much that is practically valuable, as to be greatly admired even by those who think its philosophical principles fundamentally erroneous. For the sake of conciseness, I quote from the author of the Historical and Critical Review of the speculative philosophy of the nineteenth century, the following, as the first of the points in which Dr. Whewell's work shows the transition which according to this writer philosophy is undergoing, from the Sensationalist to the Idealistic tendency: "In the broad distinction laid down between sensations and ideas; a distinction in which (unlike that of Locke, Mill, and many others,) the latter are shown to have no direct dependence upon the former, but an *a priori* existence of their own, as original forms or categories of the understanding."

It seems then according to these authorities that the idea arising in my mind of any particular object of sense is not a consequence of a previous sensation, is not derived from the sensation, but belongs to

the mind independently of it. Applied to general and abstract ideas, this is *realism* revived in full force, when we might have thought that it had received its final blow, and belonged only to history; but the language used carries us much further, and expresses something so contrary to familiar facts and plain evidence that I hardly know how to treat it.

When a Berkleyan denies altogether the existence of anything external to the mind, I understand his reasoning, and perhaps think it plausible, though I may fancy that I can see the fallacy of it, but if a material universe and a bodily frame of man furnished with senses, be admitted at all; if sensations themselves have any reality: I cannot comprehend the denial that the mind's copy of the sensation is derived from the sensation. The doctrine maintained on my own side I shall explain more fully as I proceed; the assertion incapable of evidence and made to give consistency to a theory, which I have brought under your notice, scarcely admits of argumentative treatment. It seems to me to be in itself a condemnation of the system which requires it.

It appears from what has been stated that Sensationalism professes to be a carrying out of Mr. Locke's leading ideas, by further examination of the nature and origin of that class of mental states of which his explanations are obviously incomplete or unsatisfactory. Some supporters of the doctrine, like James Mill, prefer not to meddle at all with the physical part of the question. To others this appears of no small importance in the way of evidence, and fairly within the reach of investigation. The actual dependence of sensation—though the sensations themselves belong to the mind,—on the nervous system, and this part of the frame forming the link of connection between mind and body, are truths physiologically established, generally admitted, and indeed only to be questioned by those who deny that we know anything but mind, and run into all the extravagances of a spiritual scepticism. Sensations then depend upon or uniformly accompany some kind of action or excitement of the nerves, and through them of the brain. But there are good and well known proofs that a sensation is not instantaneous, but continues as a mental state when the object no longer affects the nerve, and gradually fades away; which fact implies, of course, the continuance in the brain of the action whatever it be which caused the mental change called the sensation. We also know that there arise in our minds states which we recognise as copies or revivals of the sensations when no external

impression exists; it seems then reasonable and even necessary to conclude that these depend on a revived similar, but less vivid or less extended action of the nervous system, probably confined to the brain itself. We may be the more confident of this, from knowing as we do, that in some kinds of madness, and in some other forms of disease, which, though affections of the body, extend their influence to the mind, as well as in sleep, the revived sensation or idea may be so vivid as to create belief in an external impression, although none actually exists. Philosophers of this school have found it convenient to use the word *idea* to express the copy or revival of a sensation such as we have spoken of, and some have deemed it very important to trace the physical action as far as possible. The endeavour to refer the different kinds of mental action to different regions of the brain constitutes the basis of Phrenology, in which effort there has been some apparent success, and as it readily accounts for the different natural mental tendencies and capacities undeniably existing in different individuals, there might possibly have been much more complete success, if anatomical examination and patient observation of facts had been aided by juster views of the general laws of mind and the proper distinction of its so called faculties. We must not now, however, pursue this branch of the subject.

Dr. Hartley attempted the examination of the physical action introducing sensations with the best lights his age afforded, and concluded that there was reason to believe the nervous action to be vibratory. He consequently spoke of sensations as depending on vibration, whilst to express the less vivid or less extended action which he regarded as the corresponding physical cause of the *ideas* or revivals of sensations he invented the term *vibratiuncles* or lesser vibrations.

His object was to bring out strongly the relation between the sensations and their revivals, and thence the possibility that a principle of physical sympathy, strictly analogous with other known facts respecting the human frame, would explain and confirm the observed law according to which ideas are produced. The particular kind of action supposed was of no real importance to the theory—but, in truth, the objections commonly made to Hartley's explanation were drawn from strange perversions of his meaning by those who had never taken the trouble to study his statements. Think, for example, of men pretending to philosophy, ridiculing him for representing the nerves as acted upon like strings under tension, for which notion he never gave

the slightest pretence. What he thought of was communication along a line of minute particles some impulse, given at the external organ of sense, much in the manner of what we see to take place in a series of elastic balls. Our modern knowledge might suggest ideas of communicated action, not mechanical, which might help us on this subject and have indeed more recently been applied, though not always wisely, and within proper limits. But what Hartley proposed gave as good a notion of the real nature of the process as has ever yet been obtained, although modifications in the mode of expression might now be found expedient. We must, however, always recollect that the whole real importance of Hartley's physical theory is contained in these propositions: 1. That sensations belong to a specific action of the nerves and brain. 2. That revivals of sensations, called ideas, depend on a similar but less vivid or less extended action. 3. That ideas arise according to regular laws depending on the nature of nervous matter, and on a physical sympathy between similar contemporaneous or immediately successive excitements—giving them such mutual power over each other that the recurrence of one will bring up the idea of the other. These are propositions in themselves by no means improbable, and which have been independently supported by much curious evidence.

Whether the system be right or wrong we may safely conclude that the ridicule heaped upon Hartley's physical theory was totally misplaced, and originated in the blundering ignorance and prejudice of those who employed it.

I readily acknowledge that Dr. Hartley's attempt to digest his system into propositions and corollaries in mathematical form was injudicious; that his frequent recurrence to his vibration theory after he had once explained its evidence and purport was tiresome and repulsive, and that his style was far from being attractive; but I contend at the same time that in educing all mental states from sensations according to one fixed law, of which all supposed distinct faculties are but special cases, he has attained to the true interpretation of the nature of the mind, and has presented the principles of philosophy in their simplicity and grandeur in a way which ought to command the attention of thoughtful men, and which affords the best foundation for practical usefulness.

The mind which first perceived the real importance and extent of application of the law of association must have belonged to the highest

order, and might well claim to rank with the immortal discoverer of the law of gravitation, among the benefactors of science and of mankind; nor do I despair of a more enlightened age which shall have freed itself from the tramels of false systems now triumphant and fashionable, bestowing the honour which is due.

But the modern Sensationalist attempting to start in the manner I have indicated from Mr. Locke's fundamental principles, is probably told at once by his opponent that Locke was utterly mistaken in his rejection of innate ideas. It may be true, it is said, that the mind has no consciousness until the first sensation, but it has a constitution which determines the manner in which that sensation shall affect it, which gives to it a certain form and accompaniments. Our consciousness we are told is not of the sensation alone, but of that and something more derived from the mind itself and belonging to it—in overlooking which we should neglect the origin of our most essential ideas and most certain judgments.

Now it is quite certain that we have a specific constitution received from our Creator, which it is the object of mental science to understand; and if, beginning with sensations as the first states, and duly considering the law according to which ideas arise from them, and recur or combine together, we arrive at any states not to be thus accounted for, we must of course suppose some other origin for them: but we deny the existence of any such states and we ask for examples that we may consider them. We are probably referred to indentity, space, and time. We reply that we have already considered what is conveyed by these terms, and find them to imply complex gradually acquired notions whose history and analysis we can trace with entire satisfaction to ourselves, and we maintain that any instances proposed would be found in the same category, we feel therefore fully authorised in the course we have pursued.

Another great objection popularly urged against us is, that Sensationalism involves materialism, scepticism, and even atheism. In reply, I beg leave to ask, what philosophical opinions have in modern times been found most fruitful in atheistical tendencies, or most manifestly opposed to the influences of religion? Without any doubt the answer must be, the German transcendental philosophy, which however is no more than idealism consistently worked out.

All doctrines may be pushed to extravagance or perverted to the sanction of what the more sober part of society deems serious error,

We must nevertheless seek truth, by the best means in our power, on the subject we are investigating, and when we are satisfied, follow it into it's genuine consequences with sobriety and caution. As a matter of fact, Hartley rejected materialism, denied it's following from his principles, and considered himself as only studying the nature of the connection established by our Creator between mind or spirit, and the bodily frame. The same is true of other eminent Sensationalists who had carefully examined the consequences of the doctrine they maintained; and if some eminent men of this school have been materialists, having dwelt on the connection of mental states with the physical frame, until they persuaded themselves that the former might be functions of the latter, and that there is no ground for inferring the independent existence of the spirit in man, let it in justice be kept in mind, that a large proportion of these have been as firm believers in God the author and governor of all things, in revelations made by Him of his purposes and will, and in the future life of man, as positively made known by Him, as any defenders of any other philosophical systems whatsoever. It is then a poor controversial artifice to set up materialism as a bug-bear to frighten the weak. Let it be left to its evidence. We may not think it likely to prevail, and may ourselves be abundantly satisfied with the arguments against it, but it is not a necessary or general consequence of Sensationalism, neither supposing it adopted, has it any necessary tendency towards the pernicious and revolting doctrines which some minds will entertain, and which have been founded upon the most opposite philosophical systems. Pantheism, one of the most delusive forms of atheism, is a frequent result, and often regarded as a necessary consequence of pure Idealism.

Having myself early adopted the sensationalist philosophy; having a firm belief in its ultimate prevalence, and seeing how it is misrepresented and perverted by those who profess to give information to inquirers, I hope to be indulged in offering these few remarks in explanation of our views to a Society, whose wide field embraces equally the philosophy of the mind and of nature, the abstract and practical sciences, and the whole extent of literature and art. I am not insensible to the weight of authority against my opinions, or to the value of much that has been written by those to whom in the general theory of the mind I am opposed; but I claim on my own side that we also have our great men, and high authorities, that we are not a set of

wild opponents of everything venerable, but can show genius, learning, piety, and sober, laborious inquiry, employed in investigating the actual phenomena of mind, without setting off from any fanciful assumptions; determining the laws which regulate them, and applying these to the most important practical purposes in connection with the science of reasoning, with education, government, natural morals, and everything that concerns the intellectual progress and social improvement of mankind.

REVIEWS.

Popular Geology. By Hugh Miller. Boston: Gould and Lincoln, 1859.

This, the last work, it may be presumed, that we are to have from the pen of the lamented Hugh Miller, must not be confounded, as its title would lead one to do, with the already sufficiently numerous and superficial class of works on Popular Science. The title, "Popular Geology of Scotland," would have indicated in some respects more definitely the scope of the work. In its treatment it is fully as popular as any of Hugh Miller's previous writings, while in originality of thought and novelty of speculation it is little less scientific than any of them. As is well known to the Geological world, the author was engaged for some time prior to his death upon what he intended to be his "*Maximum Opus,*" the Geology of Scotland. The volume under notice contains the skeleton of this intended work, and consists of six lectures delivered before the Philosophical Institution of Edinburgh. It unites the graceful diction and apt simile of the author with an immense amount of original research,—qualities rarely associated in such happy combination. Hugh Miller belonged to that school of geologists, which holds that this earth has been gradually fitted for its present inhabitants, in opposition to those who maintain that "all things have been from the beginning as they are now." Mrs. Miller has contributed an able *resumé* of the progress of Geological Science, and exercises the general editorial oversight of this posthumous work. Several indications however, suffice to show that the notes of the original lectures are printed, very much in the shape in

which they were originally produced before an Edinburgh audience. Various illustrations might be produced in proof of this very pardonably scrupulous fidelity to the author's manuscript, but one will serve our purpose here, better than any others could possibly do. Lecture first begins with the consideration of the junction of geology and human history, with special reference to periods of Scottish history previous to the Roman invasion; and this introductory portion our author thus concludes: "The story of a civilized people I would fain study in the pages of their best and most philosophic historians; whereas I would prefer acquainting myself with that of a savage one archæologically and in its remains. And I would appeal in justification of the preference, to the great superiority in interest and value of the recently published 'Prehistoric Annals of Scotland,' by our accomplished townsman Mr. Daniel Wilson, over all the diffuse narrative and tedious description of all the old chroniclers that ever wore out life in cloister or cell." It is scarcely necessary perhaps to remind any of our Canadian readers, that the author of the work referred to by Hugh Miller in such terms of commendation, when addressing an Edinburgh audience to whom both were then well known; has now the citizens of our Upper Canada capital for his townsmen, and is specially known to ourselves as the editor of this Canadian Journal.

It cannot be overlooked by any intelligent critic of Hugh Miller's writings, amid all his high admiration of them, that there are passages of a theologico-controversial character, traceable to the circumstances under which some of them were first produced, in the columns of a religious and party newspaper. These lectures however, were prepared under altogether different circumstances, and designed for an audience whose presence is a safeguard against polemics. We have accordingly been gratified to find that the author does not touch upon the vexed questions involved in the theological bearings of Geology, which have already been discussed *ad nauseam,* and have become a nuisance to every practical Geologist. Commencing with the Post-tertiary, the author devotes the whole of the introductory lecture to the separation of the *geologic* from the *historic* age, in a manner highly pleasing to the antiquary,—here as everywhere else showing the large amount of general information he possessed. We are tempted to give the following rather lengthy extract, as a specimen of the author's pleasing style for the general reader; as it is only by giving such a continuous passages that the sustained vigour of his style, and the attractiveness

he throws around his theme, can be made fully apparent. It occurs in the fourth lecture, and is entitled "A Walk into the Wilds of the Oolite Hills of Sutherland:"

"Let us, however, ere we part for the evening, adventure a short walk into the wilds of the Oolite, in that portion of space, now occupied on the surface of the globe by the north-eastern hills of Sutherland, where they abut on the precipitous Ord.

"We stand on an elevated wood-covered ridge, that on the one hand overlooks the blue sea, and descends on the other towards a broad river, beyond which there spreads a wide expanse of a mountainous forest-covered country. The higher and more distant hills are dark with pines; and save that the sun, already low in the sky, is flinging athwart them his yellow light and gilding, high over shaded dells and the deeper valley's cliff, and copse, and bare mossy summit, the general colouring of the back-ground would be blue and cold. But the ray falls bright and warm on the rich vegetation around us,—tree ferns, and tall club mosses, and graceful palms, and the strangely proportioned cycadaceæ, whose leaves seem fronds of the bracken fixed upon decapitated stumps, and along the banks of the river we see intensely green hedges of the feathered equisetaceæ. Brown cones and weathered spiky leaves strew the ground; and scarce a hundred yards away there is a noble Araucarian, that raises, sphere-like, its proud head more than a hundred feet over its fellows, and whose trunk, bedewed with odoriferous balsam, glistens to the sun.

"The calm stillness of the air makes itself faintly audible in the drowsy hum of insects; there is a gorgeous light-poised dragon-fly darting hither and thither through the minuter great-like groups; it settles for a moment on one of the lesser ferns, and a small insectivorous creature, scarce larger than a rat, issues noiselessly from its hole, and creeps stealthily towards it. But there is the whirr of wings heard overhead, and, lo! a monster descends, and the little mammal starts back into its hole. 'Tis a winged dragon of the Oolite, a carnivorous reptile, keen of eye and sharp of tooth, and that to the head and jaws of the crocodile adds the neck of a bird, the tail of an ordinary mammal, and that floats through the air on leathern wings resembling those of the great vampire bat. We have seen in the minute, rat-like creature, one of the two known mammals of this vast land of the Oolite,—the insect-eating *Amphithirium*; and in the flying reptile, one of its strangely organized *Plecodactyls*.

"But hark! what sounds are these? Tramp, tramp, tramp,—crash, crash. Tree-fern and club moss, cycas and zamia, yield to the force and momentum of some immense reptile, and the colossal *Iquanodon* breaks through. He is tall as the tallest elephant, but from tail to snout greatly more than twice as long; bears, like the rhinoceros, a short horn on his snout; and has his jaws thickly implanted with saw-like teeth. But, though formidable from his great height and strength, he possesses the comparative inoffensiveness of the herbinorious animals; and, with no desire to attack, and no necessity to defend, he moves slowly onward, deliberately munching, as he passes, the succulent stems of the cycadacea. The sun is

fast sinking, and, as the light thickens, the reaches of the neighbouring river display their frequent dimples, and now and anon long scaly jacks are raised over its surface. Its numerous crocodileans are astir; and now they quit the stream, and we see its thick hedge-like lines of equeseticeal open and again close, as they rustle through, to scour in quest of prey, the dark meadows that line its banks. There are tortoises that will this evening find their protecting armour of carapace and plastron all too weak, and close their long lives of centuries. And now we saunter downwards to the shore, and see the ground swell breaking white in the calm against ridges of coral scarce less white. The shores are strewed with shells of pearl. The whorled Ammonite and the Nautilus; and amid the gleam ganoidal scales, reflected from the green depths beyond, we may see the phosphoric trail of the Belemmite, and its path is over shells of strange form and name,—the sedentary Gryphæa, the Pema, and the Plagiostoma.

"But, lo! yet another monster. A snake-like form, surmounted by a crocodilean head, rises high out of the water within yonder coral ledge, and the fiery, sinister eyes peer inquiringly round, as if in quest of prey. The body is but dimly seen, but it is short and bulky compared with the swan-like neck, and mounted on paddles instead of limbs; so that the entire creature, wholly unlike anything which now exists, has been likened to a vast boa constrcitor threaded through the body of a turtle. We have looked upon the Pleuosaurus. And now outside the ledge there is a huge crocodilean head raised, and a monstrous eye, huger than that of any other living creature,—for it measures a full foot across,—glares upon the slimmer and less powerful reptile, and in an instant the long neck and small head disappear. That monster of the immense eye,—an eye so constructed that its focus can be altered at will, and made to compromise either near or distant objects, and the organ itself adapted either to examine microscopically or to explore as a telescope,—is another be-paddled reptile of the sea, the *Tchyosaurus*, or fish-lizard. But the night comes on, and the shadows of the woods and rocks deepen; there are uncouth sounds along the beach and in the forest; and new monsters of yet stranger shape are dimly discovered moving amid the uncertain gloom.

"Reptiles, reptiles, reptiles,—flying, swimming, waddling, walking,—the age is that of the cold-blooded, ungenial reptiles; and, save in the dwarf and inferior forms of the marsupials and insectivora, not one of the honest mammals has yet appeared. And now the moon rises in clouded majesty; and now her red wake brightens in one long strip of the dark sea; and we may mark where the Ceteosaurus, a sort of reptilean whale, comes into view as it crosses the lighted track, and is straightway lost in the gloom. But the night grows dangerous, and these monster-haunted woods were not planted for man. Let us return then to the safer and better furnished world of the present time, and to our secure and quiet homes."

The above may appear but the vision of a poetic fancy, but "those who have read of the book of nature" can testify to its reality; and to our readers it is a sample of much else in the volume which

presents science under new and singularly suggestive aspects. Lecture five relates to the Lias Hills of Eathie,—a most remarkable deposit near the town of Cromarty, the birth-place of the author; the Trias and Permian systems, and the carboniferous era with its rich and beautiful Flora. The Scottish audience, as well as the Scottish authorship, is present throughout the volume. The Scottish Archæologist, Wilson, is referred to in the first Lecture. The Scottish poet, "Delta," is called in, in Lecture third, preparatory to the idealising of nature's poetical associations, in reference to Geology. Lecture fourth begins with a suggestive passage from the "Guy Mannering," of Scott; and even where our author turns with Sir Charles Lyell's aid to the facts and reasonings derived from the study of our Canadian Lake district, it is only thereby to illustrate the Geology of Scotland, "during the chill and dreary period of the boulder clay." In the sixth lecture the author is at home in his favorite Old Red Sandstone: part of the great Devonian system so extensively developed in Western Canada. The Silurian system closes this lecture, and completes the main scope of the work. An Appendix entitled, "Descriptive sketches from a Geologist's portfolio," is added at the close of the volume, for the insertion of which Mrs. Miller needlessly apologises; for nothing can be more useful than such suggestive ideas as are there wrought out. Often a small and apparently obscure fact thus noted down has helped to the solution of a difficult problem. The wonderful arrangement of the Tertiaries, for example, although far from complete, has been effected in this manner by the filling up of gaps in the succession of strata. We cannot take leave of this most interesting volume without renewing the reiterated expression of regret at the irreparable loss which science and literature alike sustained in the death of one whose peculiar gift in popularising science, as well as in enlarging its bounds, is so happily illustrated in this work. With him the popular treatment of Geology consisted not in evading and ignoring its most difficult researches, but in clothing its profoundest speculations and its abstrusest inquiries in language and thoughts so fascinating that the popular reader was lured on to a mastery of recondite truths by the overruling influence of the master mind which presented them in so attractive a guise.

J. F. S.

Meteorites. By Elijah P. Harris, Ph. D. Gottingen: W. F. Kæstner, 1859.

This is an exceedingly useful little pamphlet, containing some original investigations by Dr. Harris, and also a very carefully compiled chronological list of all known meteorites. In Kämtz Meteorologie, and Humboldt's Cosmos, we have catalogues of the same kind; but every year has made large additions to their lists, and Dr. Harris has undertaken the praiseworthy task of bringing our information up to the present date.

In the introduction, our author gives a brief account of the various theories which have been proposed, to account for those extraordinary visitors to our planet, and as might be expected, gives in his adherence to the idea of Chladni, viz: that they are of cosmical origin, or in the words of Lichtenberg, "Weltspähne: World shavings."

The author has omitted to mention the theory of Dr. Smith, which, as a compromise between the cosmical and the lunar hypothesis, is of some interest. According to this theory, the meteorites have been ejected from volcanoes in the moon; not directly on to the earth, but with such force, as to remove them from the influence of the moon's attraction and to cause them to acquire a course of their own, under the influence of the neighbouring planets. The hypothesis has been critically examined by Mr. Gregg.

It is only recently, that Wöhler announced the presence of an organic or carbonaceous matter in the meteorite of Kaba and Dr. Harris has also proved the presence of a similar substance in the stone from the Cape of Good Hope: two very curious discoveries, which throw some light on the previous history of these remarkable bodies.

Dr. Harris has furnished very carefully conducted analyses of these meteorites, first, the stone which was observed to fall near Krahova in Hungary, on the 19th May, 1858, that of Bokkewald, Cape of Good Hope, 13th October, 1838, and the meteorite of Mont Rejean in France, which fell on 9th December, 1858.

The following table represents the results of the analyses:

	I.	II.	III.
Magnetic	8.56	....	8.41
Unmagnetic	91.44	....	91.59

MAGNETIC PART.

	I.	II.	III
Iron	82.95	....	84.71
Nickel	14.41	....	12.11
Cobalt	1.08	....	0.72
Manganese	....	....	0.50
Chromium	0.76	....	trace.
Phosphorus	0.12	....	"
Sulphur	trace.	....	2.14

THE UNMAGNETIC PART.

	I.	II.	III.
Silica	41.14	30.80	42.00
Magnesia	27.06	22.20	27.39
Protoxide of iron	24.57	29.94	19.65
Alumina	2.46	2.05	2.46
Lime	0.75	1.70	....
Protoxide of Manganese	0.46	0.97	0.33
Soda	1.92	1.28	1.23
Potassa	0.56		0.20
Graphite	0.15	1.67	....
Sulphur	trace.	3.38	2.09
Copper	"	0.03	0.26
Iron	....	2.50	....
Nickel	....	1.30	....
Bituminous matter	....	0.25	....
Oxide of Chromium	....	....	0.83
Iron as Sulphide	....	....	2.74

Owing to the work having been printed at Göttingen, it contains an unfortunate quantity of typographical errors, and of German expressions which occasionally render the writer's meaning somewhat obscure. This occurs particularly in the portion where the method of analysis is described, and it is to be hoped, that as Dr. Harris is now a resident amongst us, holding the chair of modern languages in Victoria College, he may be induced to reproduce this portion of his pamphlet in a corrected form.

H. C.

Taylor's Treatise on Poisons. 2nd Edition. Blanchard & Lea. 1859.

In the July number of the Canadian Journal, while reviewing that portion of Dr. Taylor's work on poisons, which treats of arsenic, the writer was induced to make some objections to the restricted use of

Reinsch's test as recommended by the author, and at the conclusion of the paper, brought forward the preliminary evidence in the Smethurst case, as a confirmation of his views, inasmuch as a solution was examined for arsenic, a number of times without success; and the poison was only discovered after repeated operations. We formerly gave great credit to Drs. Taylor and Odling, for their perseverance and skill in detecting arsenic under such circumstances, a proceeding which is only rendered difficult, by a bigoted adherence to one method of treatment. We then intimated that the non-detection of arsenic must have been owing to some other mysterious agent than chlorate of potassa. The mystery has since then been cleared up; the fact being, that there was no arsenic present, except such as existed in the copper employed, and was dissolved during the progress of the experiment.

Herapath has well observed, that no ordinary copper could possibly contain such an amount of arsenic as was found by Dr. Taylor; this is undoubtedly true, but on the other hand it is well known, that no reliance is to be placed on the method adopted by Dr. Taylor for ascertaining the quantity present.

In the evidence given at the trial which has since taken place, it appears that arsenic was detected in a portion of an evacuation, but it must be remembered that the same copper was employed and that nothing is said concerning the absence of nitrates, chlorates, &c.

In some of the articles which have appeared in recent English newspapers on the subject, doubt is thrown on chemical evidence as to the presence of poisons. In the case of arsenic and all mineral poisons, we most decidedly object to this opinion; there is no difficulty and no uncertainty affecting our decision on this subject, if proper precautions be adopted, and if we do not refuse to avail ourselves of the results of recent and accurate investigations.

In a late number of the Philosophical Magazine, Davy has shown that arsenic is present in the superphosphate of lime, used as a manure, owing to the employment of impure sulphuric acid in its preparation. He has also detected it in turnips grown on soil treated with this manure, and in peas grown in mould moistened with a solution of arsenious acid.

The test employed in all cases, was however, that of Reinsch, and the copper may have contained arsenic. Davy states that the reagents were proved to be pure, but as in the principal experiment, the copper was boiled with the acid for three hours, and as we know from Odling's

experiments, that copper is really dissolved after long boiling, so much doubt is thrown on these results as to call for further and more accurate investigation.

H. C.

SCIENTIFIC AND LITERARY NOTES.

NATURAL HISTORY.

THE EXTINCT AMERICAN HORSE.

At a recent meeting of the Academy of Natural Sciences of Philadelphia, Prof. Holme, exhibited a collection of Fossils from the post-pliocene of South Carolina, accompanied with some highly interesting remarks and references. From the latter we select the following, especially for its bearing on the former existence of the horse on this continent, contemporaneously with the Mastodon and others of the later extinct fauna of prehistoric times:—

"The collections contain remains of the horse, ox, sheep, hog and dog, which I feel strongly persuaded, with the exception of many of those of the first mentioned animal, are of recent date, and have become mingled with the true fossils of the post-pliocene and eocene formations, where these have been exposed on the banks of the Ashley River and its tributaries. In regard to the remains of the horse, from the facts stated in the account given of them in the succeeding pages, I think it will be conceded that this animal inhabited the United States during the post-pliocene period, contemporarily with the *mastodon*, *megalonyx*, and the great broad fronted bison.

"Many of the mammallian remains are of recent animals, or at least are undistinguishable from the corresponding parts of the latter; and if they are not accidental occupants of the post-pliocene deposit, are highly interesting, as indicating their contemporaneous existence with many species and genera now extinct.

"It appears to be quite well authenticated that the horse, which is now so extensively distributed, both in a wild and domestic condition, throughout North and South America, did not inhabit these continents at the time of their discovery by Europeans. With this fact in view, in conjunction with the circumstance that animal remains of late periods may become accidental occupants of earlier geological formations; we should require strong evidence to be advanced before it is admitted that the horse belonged to an ancient fauna of the western world. At the present time the evidence appears to be sufficiently ample to justify the latter conclusion, and it is further sustained by the discovery, in the same part of the world, of the remains of two species of the closely allied genus *Hipparion*.

"Remains of the horse, discovered in Brazil, Buenos-Ayres, Chile, have been indicated by Dr. Lund, Prof. Owen, M. Weddell and M. Gervais. These remains exhibit no well marked characters distinguishing them from corresponding portions of the skeleton of the recent horse, and from a comparison of the figures and

descriptions which have been given of most of them, together with some remarks of the latter author, it is doubtful whether they belong to more than a single species, the *Equus neogœus* of Dr. Lund.

"Prof. Buckland and Sir John Richardson have described remains of the horse, discovered in association with those of the elephant, moose, reindeer, and musk-ox, in the ice cliffs of Eschscholtz Bay, Arctic America.

"In the United States, remains of the horse, chiefly consisting of teeth, have been noticed by Drs. Mitchell, Harlan, and DeKay, but these gentlemen have neither given descriptions nor figures by which to identify the specimens. Some of the latter are stated to have been found in the vicinity of Neversink Hills, New Jersey; others in the excavation for the Chesapeake and Ohio Canal, near Georgetown, District of Columbia; and some in the latter tertiary deposit on the Neuse River, in the vicinity of Newbern, North Carolina. Dr. DeKay, in speaking of such remains, says, 'they resemble those of the common horse, but from their size apparently belong to a larger animal,' and he refers them to a species with the name of *Equus major*.

"Dr. R. W. Gibbes has given information of the discovery of teeth of the horse in the pliocene deposit of Darlington, South Carolina; in Richland District of the same State; in Skidaway Island, Georgia, and on the banks of the Potomac River. He further observes that he obtained the tooth of a horse, from eocene marl, in the Ashley river, South Carolina, but the researches of Prof. Holmes indubitably indicates the specimen to have been an accidental occupant of the formation.

"Specimens of isolated teeth, and a few bones of the horse, from the post-pliocene and recent deposits of this country, have frequently been submitted to my inspection. Many of these I have unhesitatingly pronounced to be relics of the domestic horse, though I feel persuaded that many remains of an extinct species are undistinguishable from the recent one.

"Whether more than one extinct species is indicated among the numerous specimens of teeth I have had the opportunity of examining, I have been unable satisfactorily to determine. The specimens present so much difference in condition of preservation, or change in structure; so much variation in size, from that of the more ordinary horse to the largest English dray horse; and such variableness in constitution, from that of the recent horse to the most complex condition belonging to any extinct species described, that it would be about as easy to indicate a half dozen species as it would two.

"Under the circumstances, I would characterize the extinct horse of the United States as having had about the same size as the recent one, ranging from the more ordinary varieties to the English dray horse, with molar teeth, frequently comparatively simple in construction, but with a strong disposition to become complex.

"Among the number of teeth of the horse in Prof. Holmes' collection labelled as coming from the post-pliocene deposit of Ashley River, there are several which, from their size, construction and condition of preservation, I feel convinced are of recent date: and these no doubt became mingled with the true fossils of that formation where it is exposed on the Ashley River, in which position I personally found undoubted remains of the recent horse and other domestic animals

and objects of human art, mingled with remains of fishes, reptiles, and mammals, washed by the river from the banks, composed of eocene and post-pliocene deposits.

"Teeth of an extinct species of horse, however, undoubtedly belong as true fossils to the post-pliocene formations in the vicinity of Charleston. These are usually, hard in texture, stained brown or black from the infiltration of oxide of iron, sometimes well preserved, but more frequently in a fragmentary condition and water-worn. Generally they are not larger than the teeth of the more ordinary varieties of the domestic horse, and sometimes are quite as simple in the plication of their enamel, but usually are more complex and sometimes exceedingly so.

"One figured represents a first superior molar tooth, neither larger nor more complex in structure than the corresponding tooth of the recent horse. This specimen, which is dense and jet black in color, was obtained by Prof. Holmes from a stratum of ferruginous sand, two inches thick, exposed on the side of a bluff, on Goose Creek, about twelve miles from Charleston.

"Having expressed a desire to see the locality from which the tooth just mentioned was obtained, Prof. Holmes afforded me the opportunity of doing so. The bluff is about thirty feet high; its base is formed of a pliocene limestone, about fifteen feet thick, and composed of the debris of marine shells; above this is the stratum of ferruginous sand, of post-pliocene age, containing numerous pebbles and rolled fragments of bone all blackened like the tooth obtained from the same position. Overlying the latter stratum, there is a layer of stiff blue clay, about two feet in thickness, and above this there are about twelve feet of sand and earth-mould.

"A similar blackened tooth was obtained from the same formation at Doctor's Swamp, John's Island.

"Another figure represents a remarkably well preserved specimen of a lower molar above referred to from Georgia, where it was discovered by J. H. Couper, in association with equally well preserved remains of other extinct animals. The tooth is brown in color, and it neither differs in size nor form from its homologue in the recent horse.

"In the collection of fossils of Prof. Holmes, there is the specimen of an upper first large molar, labelled from Texas, represented in figure 5. The tooth is of the largest comparative size, and exhibits the highest degree of complexity in the folding of its enamel; in both of which characters it differs in such a remarkable degree from the corresponding tooth, represented in figure 5, from the post-pliocene formation of South Carolina, that it appears hardly possible that these two teeth should belong to the same species of horse.

"A remarkably well preserved specimen of an upper molar-tooth, jet black in color, and an incisor, yellow and quite friable in texture, both belonging to the extinct horse, from North Carolina, have been submitted to my inspection by Prof. Emmons.

"Among the most interesting of the fossils discovered by Prof. Holmes, in the post-pliocene beds of the Ashley River, are two molar teeth of a species of the equine genus *Hippotherium*. These are the first remains of the latter discovered in America, and they indicate the smallest known species.

"Both specimens are from the upper jaw, and they are well characterized, not only by the isolation of the internal median column, but also by the complex plication of the interior or central enamel columns.

"The larger specimen is firm in texture; has the enamel stained jet black, and the dentine and cement gray.

"I have personally had the opportunity of inspecting remains of the tapir, found in Texas, Louisiana, Kentucky, Mississippi, Indiana, Ohio and South Carolina, proving an extensive range of this animal at one time over the country of the United States.

"The specimens which were presented by Dr. Carpenter to the Academy of Natural Sciences of Philadelphia, on close comparison are not found to differ from the corresponding parts of the living *Tapir*''*s americanus.*

"The post-pliocene deposit of the Ashley River contains a number of small fragments of molar teeth, and one nearly entire and unworn crown of a second lower molar, which have the same characters of form and size, as in the living tapir. Besides these, the same collections contain fragments of lower molars, and two nearly entire crowns of upper molars, having the exact form of the corresponding teeth of the *T. americanus*, but larger in size.

"Teeth of the beaver, jet black in color, have likewise been obtained from the post-pliocene deposit of Ashley River.

"The collections contain numerous specimens of blackened molar teeth, together with a few incisors and fragments of jaws, from the Ashley post-pliocene deposit which neither differ in form nor size from the corresponding parts of the recent musk-rat.

"Remains of *Lepus sylvaticus*—common gray rabbit—have been found in association with those of other rodents and of the extinct peccary near Galena, Illinois. A few specimens of molar teeth, black in color, apparently belonging to this species, were obtained from the post-pliocene beds of the Ashley River.

"Several small fragments of teeth of the *Megatherium*, in Prof. Holmes' collection, were obtained from the post-pliocene bed of the Ashley River. Previously to the discovery of those specimens, remains of the *Megatherium* had been found in no other locality of North America than in the State of Georgia.

"Two small fragments of lower molar teeth of *Mylodon harlani* were obtained from the Ashley post-pliocene beds. One of the fragments is represented in figure 21, plate xvi. of 'A Memoir on the extinct Sloth Tribe of North America' by the author.'"

On these remarks from the pen of Professor Leidy, Professor Holmes observes:

As regards the specimens of human art found as above, it must be remarked that it is only at this locality—Ashley Ferry—that we find such relics. Here at the base of a low bluff, is a beach of eocene marl; above the bluff is a farm-yard, and all the sweepings of the premises, consisting in part of old hoes, broken plough-shares, and fragments of crockery-ware, etc., are thrown into the river, and lie mingled with the fossils which are washed out of the bluff, and scattered over the surface of the beach below, which is exposed at low tide. At no other locality on this river, and there are several, viz.: Ramsay's, Clement's, Greer's, Middleton's, &c., where similar fossils are found, do we obtain relics of human art; at least I have never found such.

From the foregoing it would appear that of the ancient fauna of America, which included representatives of many of our present domestic animals, some species have undoubtedly become extinct; but I confess I am not yet prepared to admit from any evidence yet adduced, or from my own examinations, that all of the living species are distinct from those found fossil in the post-pliocene. The teeth and bones of the rabbit, raccoon, opossum, deer, elk, hog, dog, sheep, ox and horse, are often found in these beds, and though associated with those known to be extinct, such as mastodon, megatherium, hipparion, &c., need not necessarily be referred to extinct races also; since their remains cannot be distinguished from the bones and teeth of the living species.

It has been just remarked that about ninety-five per cent., or nearly all of the one hundred and fifty shells of molluscous animals from these beds are specifically identical with the recent or living species of the coast,—two are found only at the south of this, and two are extinct. Of the vertebrates from the same bed, the tapir, peccary, raccoon, opossum, deer, musk-rat, rabbit, beaver, and elk have still their living representatives, generically, if not specifically; and even of the identity of species there seems to be no doubt, as no anatomical differences can be discerned. Two of these species, like the mollusca just alluded to, no longer live in South Carolina; the tapir and peccary are only found in South America and Mexico; the musk-rat, elk, and beaver, though extinct on the Atlantic coast, are still living in the interior of the country. And though it has been acknowledged that the mastodon, megatherium, elephant, glyptodon, and two species of Equine genera, &c., are entirely extinct, yet the discoveries made of the remains even of some of these, would indicate that they still existed at a period so recent, that, in the language of Professor Leidy, "it is probable the red man witnessed their declining existence."

The peccary, or Mexican hog, an animal common in Mexico, is not indigenous to the Atlantic United States; but his bones have been found associated with human remains in caves used as cemeteries by the Aborigines. "A tomb in the city of Mexico," according to Clavigero, (?) "was found to contain the bones of an entire mammoth, the sepulchre appearing to have been formed expressly for their reception." And "Mr. Latrobe relates that during the prosecution of some excavations, near the city of Tezcuco, one of the ancient roads or causeways was discovered, and on one side, only three feet below the surface, in what may have been the ditch of the road, there lay the entire skeleton of a mastodon. It bore every appearance of having been coeval with the period when the road was used."

Again says Professor Holmes, I extract from Professor Leidy's letter:

"The early existence of the genera to which our domestic animals belong, has been adduced as presumptive evidence of the advent of man at a more remote period than is usually assigned. It must be remembered, however, even at the present time, that of some of these genera only a few species are domesticated; thus of the existing six species of *Equus* (horse) only two have ever been freely brought under the dominion of man.

"The horse did not exist in America at the time of its discovery by Europeans; but its remains, consisting chiefly of molar teeth, have now been so frequently

found in association with those of extinct animals, that it is generally admitted once to have been an aboriginal inhabitant. When I first saw examples of these remains I was not disposed to view them as relics of an extinct species; for although some presented characteristic differences from those of previously known species, others were undistinguishable from the corresponding parts of the domestic horse, and among them were intermediate varieties of form and size. The subsequent discovery of the remains of two species of the closely allied extinct genus Hipparion, in addition to the discovery of remains of two extinct equine genera of an earlier geological period, leaves no room to doubt the former existence of the horse on the American continent, contemporaneously with the Mastodon and Megalonyx; and man probably was his companion."

The result of the whole seems to be, that of the animals found fossil in the post-pliocene beds, all the mollusca of the present day are undoubtedly a perpetuation of the same species; that of the higher order of vertabrata, the tapir, peccary, raccoon, opossum, deer, elk, and musk-rat are equally entitled to be considered the descendants of this ancient race. And if the claims of the mollusca to this distinction rest upon a secure basis, because they are peculiar to this country, and not obnoxious to suspicion of foreign immigration, it must be recollected that this is equally true of the above named animals.

Those which have hitherto been regarded as of recent and European origin, are the horse, sheep. hog and ox; and it must be reserved perhaps for future consideration to determine how far the negative proof of the non existence of these animals in the country at the time of its discovery may be regarded in each individual case sufficiently strong to settle the question of his extinction and re-introduction, when so many of his associates and contemporaries have succeeded in maintaining an unbroken line of descent down to the present day.

The questions involved in the final results of these discoveries are as varied as they are important. Professor Agassiz has taken up the inquiry with lively interest, and in a letter to Professor Holmes observes:—"The circumstances under which these remains are found, admit of no doubt, but the animals from which they are derived, existed in North America long before this continent was settled by the white race of men, together with animals which to this day are common in the same localities, such as the deer, the musk-rat, the opossum, and others only now found in South America, such as the tapir. This shows beyond the possibility of controversy, that animals which cannot be distinguished from one another, may originate independently in different fauna, and I take it that the facts you have brought together are a satisfactory proof that horses, sheep, bulls and hogs, not distinguishable at present from the domesticated species, were called into existence upon the continent of North America prior to the coming of the white race to these parts, and that they had already disappeared here when the new comers set foot upon this continent; but the presence of tapir teeth among the rest show also that a genus peculiar to South America and the Sunda Islands existed also in North America in those days, and that its representative of that period is not distinguishable from the South American species."

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST—JUNE, [illegible].

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 min. 33 sec. West. Elevation above Lake Ontario, 108 feet.

Days.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	MEAN.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N.	Excess of mean above Average.	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N.
1	29.750	29 732	29 026	29 6953	° 52 3	° 60 6	° 56.6	° 56 35	° − 0 60	369	480	406	399	94	.51	.89	.87
2	.496	542	564	5317	65 9	74 7	59 9	64 13	+ 6 97	432	370	357	388	97	.46	.68	.68
3	.508	613	830	6082	56 8	61 7	41 8	52 22	− 5 35	386	213	174	255	83	.38	.64	.62
4	.926	945	926	9297	36 4	39 1	36 4	38 13	19 72	139	140	151	142	85	.88	.89	.62
5	.925	831			40 7	54 3		—		160	246	—		64	.54	—	—
6	.900	876	924	8570	45 8	61 3	48 7	53 27	5 15	210	198	245	219	67	.35	.71	.66
7	.792	655	490	6444	50 1	62 6	50 3	57 77	0 09	272	293	329	311	74	.51	.64	.65
8	.904	409	662	4768	58 8	62 4	46 9	55 50	3 37	430	313	243	324	87	.55	.76	.73
9	.711	606	587	6290	46 9	58 1	56 1	54 32	− 5 17	244	303	289	291	71	.61	.64	.68
10	.597	685	845	7187	44 7	51 9	42 5	44 95	14 95	160	158	164	160	53	.46	.50	.55
11	.949	908	901	9155	36 4	53 2	43 6	45 62	−14 37	156	213	235	200	73	.51	.82	.66
12	.878	697			45 1	53 4			--	247	259			82	.63		—
13	.419	457	637	5135	58 1	65 0	59 9	61 90	+ 1 32	457	586	439	504	95	.95	.85	.90
14	.708	664	614	0575	54 8	59 2	53 9	56 53	4 30	379	389	410	390	83	.77	.92	.88
15	.444	665	372	3597	52 7	72 2	65 1	62 37	+ 1 25	374	617	374	465	94	.78	.64	.81
16	.490	662	392	5302	53 5	58 3	50 9	54. 62	− 6 73	316	312	221	285	76	.63	.55	.66
17	.596	655	505	5478	40 9	57 0	53 6	54 27	− 7 59	261	312	299	273	72	.67	.70	.64
18	.539	550	596	5693	54 0	67 8	57 7	59 27	− 2 65	254	279	233	236	62	.31	.46	.47
19	.653	590			63 9	67 1	—		—	283	163			68	.25		—
20	.431	321	340	3505	53 7	63 9	57 4	57 72	− 4 73	341	476	425	413	87	.79	.90	.86
21	.358	350	347	3583	55 9	61 3	53 4	57 40	5 97	387	397	365	383	86	.73	.89	.81
22	.396	490	586	4930	65 9	66 4	57 9	60 67	− 2 98	375	449	389	387	84	.68	.80	.73
23	.674	704	725	7050	55 9	67 1	60 5	62 10	1 05	372	368	316	347	73	.55	.65	.62
24	.737	707	662	7047	60 3	68. 6	60 2	63 48	+ 0 97	334	436	375	360	63	.60	.78	.66
25	[illegible]	703	721	7058	59 9	73 3	63 9	66 03	+ 2 46	391	406	362	372	75	.50	.60	.65
26	.708	758	-	—	69 9	72 0	—	—	—	380	427	-		73	.51	—	—
27	.711	611	544	6137	65 1	80 4	74 0	74 03	+ 9 97	472	595	615	560	73	.58	.74	.69
28	[illegible]	656	595	6278	73 8	79 8	72 5	75 03	+10 75	633	770	650	674	77	.76	.92	.76
29	.557	416	563	5115	74 3	85.2	64.0	73 06	+ 9 60	676	609	349	533	80	.49	.58	.63
30	.618	767	709	7643	51.0	59 5	54.8	55 20	− 9 55	.219	306	336	.284	57	.60	.78	.65
M'n	29.6[illegible]	29 6308	29 6108	[illegible]	54.31	64 22	55 61	58.20	− 2.72	.347	.370	.3[illegible]	.3[illegible]	.77	.6[illegible]	.7[illegible]	.6[illegible]

Days.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Resultant Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result.	M'N.	Rain in Inches.	Snow in Inches.
1	N N E	E b S	E b N	° S 76 E	3 2	8 0	3.5	3 63	5 07	0 330	..
2	S S W	W S W	S W b S	S 67 W	8 4	15.0	6 0	7.87	8.23	0 056	..
3	S W b W	W b N	N W b N	N 59 W	6 0	23.5	16 2	15 79	17 81	Inap	Inap
4	N W b N	N W	S b W	N 55 W	13 0	9 6	2.4	4 76	8 10		Inap
5	N W b W	S	S b W	S 65 W	4 6	13 2	5 0	2 21	6 07	..	..
6	N N W	S	Calm.	S 1 E	0 8	4.5	0 0	2 75	3 19	.	...
7	E b S	E S E	S E	S 67 E	1 0	6 6	4 6	4 44	6 06	0 135	...
8	S S W	W N W	N W b N	N 63 W	6 2	30 0	1 0	11 63	14 34	0 980	..
9	N N W	S b E	W S W	S 63 W	6 0	6 5	5 2	4 96	8 78	0 050	..
10	N W	N W b N	N W	N 46 W	11 5	22 2	5 2	11 71	12 27	0 030	.
11	N W b W	S b E	S	S 10 E	11 0	12 5	3 4	4 32	7 04		.
12	E N E	E b S	E S E	S 38 E	2 5	9 0	3 0	4.75	6 39	0 295	..
13	S W b S	S W b S	N N W	S 63 W	9 8	4.8	8 0	5.39	7 06	0 075	..
14	N N W	E S E	E b N	N 86 E	7 0	9 5	2 5	4.04	7 73		..
15	E b N	S b W	N N W	S 71 W	0 8	14.0	13.4	3 96	7 07	0 900	...
16	W N W	N W b N	N	N 36 W	5.4	7 5	1 6	4.96	5.58	...	...
17	N b E	E	N W	N 84 E	4.3	5.2	4 4	4.56	6 74	..	...
18	N N W	N W	N N W	N 39 W	0.5	11 5	6.5	4 82	7.57		...
19	N b W	S E b S	E	S 73 E	4 5	7.2	3.6	2 79	4.08	0 060	...
20	N E b E	E b S	E b N	N 70 E	1.2	10.6	2.6	5 79	4 07	0 460	...
21	N b W	S	W b N	S 67 W	3.8	7.2	0 2	4.36	5 33		...
22	W	S S W	N b E	N 65 W	6.0	9.6	5 4	3 66	6 23	Inap	..
23	N b W	S b E	S E b S	N 42 W	1.6	6.2	4.4	1 66	4.46	....	.
24	N E b N	S b S	E b N	N 11 E	6.4	6.6	1.0	4 06	4.56	..	...
25	N	S b W	N	N 34 W	0 5	7 5	7.1	2 10	4.52	...	...
26	N	E S E	E	S 64 E	1 5	6.8	2 5	3.36	3.65	...	...
27	E	S	S W b S	S 9 W	3 8	13.2	7 5	6 92	7 33	0 016	...
28	W S W	S b W	S W b S	S 26 W	4 0	12 6	4.0	6.39	6 36	0 060	...
29	S W	W b S	N W	N 71 W	3 0	19.6	20 0	12 86	17 83	0 045	...
30	N N W	S b W	S b W	S 71 W	12 2	9.5	1.6	2 02	5.56	....	...
M'n	....	....	....	....	5.19	11.17	5.42	....	7.19	[illegible]	Inap

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR JUNE.

Highest Barometer .... 29.966 at 8 a. m., on 11th } Monthly range = 0.706 inches
Lowest Barometer .... 29.260 at 4 p. m. on 16th }

Self-register'g Thermom.
- Maximum Temperature .... 83°4 on p. m. of 29th } Monthly range = 54°2
- Minimum Temperature .... 29°2 on a. m. of 5th }
- Mean maximum Temperature .... 66°93 } Mean daily range = 17°11
- Mean minimum Temperature .... 49°82 }
- Greatest daily range .... 27°8 from a. m. to p. m. on 6th.
- Least daily range .... 8°4 from a. m. to p. m. on 3rd.

Warmest day .... 28th ... Mean temperature .... 75.03 } Difference = 36°90.
Coldest day ..... 4th . Mean temperature ..... 38°13 }

Maximum { Solar .... 100°8 on p. m. of 29th } Monthly range = 81°5.
Radiation. { Terrestrial .... 19°3 on a. m. of 11th }

Aurora observed on 3 nights, viz., on 8th, 15th, and 25th.
Possible to see Aurora on 20 nights; impossible on 10 nights.
Snowing on 2 days,—depth, inapp.; duration of fall 2 hours.
Raining on 16 days,—depth 4 065 inches; duration of fall 23 6 hours.
Mean of cloudiness = 0.50.
Most cloudy hour observed, 6 a. m., mean = 0.57; least cloudy hour observed, 10 p. m., mean, = 0.48.

Sums of the components of the Atmospheric Current, expressed in miles.

North.	South.	East.	West.
1814.75	1810.29	943.63	2811.30.

Resultant direction N. 77° W.; Resultant Velocity 1.95 miles per hour.
Mean velocity .... 7.19 miles per hour.
Maximum velocity .... 37.0 miles, from 10 to 11 p. m. on the 29th.
Most windy day .... 29th . Mean velocity 17.63 miles per hour.
Least windy day .... 6th . Mean velocity 3.19 ditto.
Most windy hour ...... 1 to 2 p. m. ...... Mean velocity 11.34 ditto. } Difference
Least windy hour .... 2 to 3 a. m. .... Mean velocity 4.40 ditto. } 6.96 miles.

1st. Dense Wetting Fog, 6 a. m. to noon. Sheet Lightning, 9 p. m. to midnight.—2d. Thunderstorm, 3 to 5 a. m.—3rd. A few particles of snow fell, 8 to 9 p. m. Very cold night.—4th. Particles of snow fell at 7 a. m. Very cold day.—5th. Sharp frost and thin ice, 5.30 to 7 a. m.—6th. Hoar frost at 6 a. m.—7th Thunder storm, 8 p.m. to midnight.—8th. Thunderstorms with large Hailstones, 11 to 11 25 a. m. 11th Hoar frost and thin ice at 5 30 a. m. Cold day. 13th, 14th, and 15th Dense fog, a. m.—15th. Thunderstorm, 2 to 4 p. m. Lunar Halo at 10 p. m. (imperfect).—20th. Thunderstorm 6 59 to 8 45 p. m. Pollen of Plants fell during this storm.—22nd. Portions of double Rainbow at 6.30 p. m. Colors brilliant—27th Thunderstorm 10.50 to 11.20 p. m.—28th. Thunderstorm from 7.30 p. m. Sultry day.—29th. Thunderstorm from 0 30 to 0.45 p. m. Splendid meteor at 9 p. m.—30th. Cold day. Mean Temperature, 17.85 below that of preceding day.

Heavy dew on the mornings of 7th, 9th, 12th and 23rd.

Registered Maximum Temperature on p. m. of 29th 86.4
Registered Minimum Temperature on a. m. of 30th 50.0

Range in less than 18 hours 36.4

The frost which was so destructive to vegetation on the 5th and 11th of this month was the most severe recorded here since 2nd June, 1843.

June 1859, was cold, wet, and windy, the Mean Temperature being 2 97 below the average of 20 years. The Rain, 0.887 inches on the surface above the average of the same number of years, and the Wind 2 18 miles per h above the average of 12 yrs.

The Resultant Direction and Velocity of the Wind for the month of June from 1848 to 1859 inclusive, were respectively—West and 0 46 miles.

COMPARATIVE TABLE FOR JUNE.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	M'n.	Diff. from Aver.	Max ob'd.	Min. ob'd.	Range.	No. of days.	Inch's.	No. of days.	Inch's.	Resultant Direction.	Resultant V'y.	Mean Force or Velocity.
	°	°	°	°	°							
1840	59 8	—1 5	78.5	37 1	41.4	11	4.860	...	...	..	..	... .
1841	65 6	+4.3	92.8	45 7	47 1	9	1.560	...	...		..	0 36 lbs.
1842	55 6	—5.7	73 9	28.0	45.9	15	5 755	..	...	..	...	0.31
1843	58.4	—2.9	81.3	29 5	52 3	12	4. 595	...	...	..	...	0.27
1844	59 9	—1 4	82.8	33 1	49 7	9	3 535	..	...	..	.	0.19
1845	61.0	—0 3	83 6	40 9	42.7	11	3 715	.	...	..	..	0.27
1846	63 3	+2 0	83 3	41 5	41 8	10	1.920	...	...	.	..	0.32
1847	58.4	—2.9	78 3	36 7	41 6	14	2 625	..	...	...	.	0.30
1848	62 9	+1.6	92 5	38 3	54.2	8	1.610	...	...	N 81° W	1.90	4.51 mls.
1849	63 2	+1 9	84 9	45 2	39 7	7	2.020	..	...	S 71° E	0 49	3.32
1850	64 3	+3 0	83 2	49 0	34 2	10	3 345	...	...	S 69° W	0 38	4.54
1851	59 2	—2 1	79 2	41 2	38.0	11	2.695		...	S 9° W	1 26	4.42
1852	60 8	—0 5	86 1	43 6	42 5	10	3 160	.	...	S 78° W	1 49	4 09
1853	65 5	+4 2	86 8	43.3	43.0	9	1 650	...	...	N 1° W	0 10	3.73
1854	64 1	+2 8	88 7	47 4	41 3	9	1 460	.	...	N 24° E	0 71	4 15
1855	59 9	—1.4	90 7	40.6	50 1	17	4.070	...	...	N 69° W	1 33	5 70
1856	62 1	+0 8	82 6	48.3	34.3	13	3 200		...	S 21° W	0 90	5.30
1857	56 9	—4.4	75 1	40.9	34.2	21	5.060	...	...	N 40° W	1 15	7 60
1858	66 2	+4.9	96 3	48 7	37.6	12	2.943	.	...	S 20° E	0.26	5 63
1859	58.3	—3.0	85.2	33 9	51.3	16	4 065	2	Inap.	N 77° W	1.95	7 19
M	61.27	...	83 76	40.59	43.17	11.7	3.199	...	...	....	...	5.01 Mls.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—JULY, 18[illegible].

Latitude—43 deg. 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't. Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result.	M'N	Rain in inches.	Snow in inches.
1	29 684	29 585	29 516	29.5748	52.7	67 8	60 6	60 93	− 3 83	288	360	457	301	72	57	86	78	s b w	s E b s	E s E	s 29 E	0.6	7 0	1 0	2 32	2 89	0 471	...
2	296	.150	348	2863	63.1	78 3	66.4	70.26	+ 5 25	545	702	560	604	94	72	87	82	s w	s w b w	N w b N	s 80 w	0.5	13 4	0 5	7 04	10 72	108	...
3	539	703			50 5	58 4	—	--	—	.380	265			98	54		—	N	N w b E	N N W	N 28 W	12 6	16 5	10 5	11 77	11 89	inap.	...
4	993	30 025	30 023	30 0238	51.2	59 6	52 3	55 08	10 22	244	294	272	260	65	58	69	62	N N W	s b w	s s w	s 35 w	3 2	10 2	2 2	3.73	5 07	...	...
5	30.096	30 009	30 000	30 0175	53 0	67 0	56.8	60 62	− 4 87	272	360	352	328	68	58	.76	62	N w b w	s b w	s E b s	s 4 E	4 5	5 6	3 2	2 56	3 67		...
6	29 981	29 930	29.911	29 9383	58 1	62 2	58.1	59 37	6 23	374	403	403	398	77	.73	84	79	N E	s w b s	s w b s	s 23 w	2.8	8 2	1 2	2 17	3 51	045	...
7	874	.859	813	8383	58.3	67 5	60 4	62 27	− 3 43	442	505	415	452	89	.76	78	81	Calm	N	E b s	s 50 E	0.0	1 5	0 5	1 09	3 91	.	...
8	.818	.803	797	8070	61 0	73 3	63 5	66 38	+ 1 10	429	508	498	473	77	61	79	72	b N E	s s E	s s E	s 55 E	3.5	4.5	1 2	2.22	2 86	.	...
9	875	.868	839	8603	65 7	74 5	64 2	68 66	+ 2 67	477	333	328	366	78	40	55	.57	N E b E	E b s	E b N	N 88 E	1.0	5 2	6 8	4 09	4 97	...	...
10	.664	316		—	61 0	72 0	—		—	.342	354			63	.45			E N E	E S E	N	N 67 E	2 0	4 6	3 3	2 43	3 07	.	...
11	764	701	.697	7212	66 8	82 3	72 9	75 06	+ 8 87	528	670	630	632	81	60	79	73	N	s s w	w	s 38 w	0 8	11 8	0 5	3 26	3 94	...	...
12	760	673	681	.7017	74 0	84 3	78 3	79 85	+13 58	614	683	587	637	74	58	61	.63	Calm.	s s w	N N W	s 79 w	0 0	5 3	1 5	1 49	3 01	...	...
13	685	711	729	7055	72 0	82 7	75.4	77 63	+11 25	665	738	602	678	.77	66	.79	72	N N W	s s E	E b N	s 71 E	3.3	6 0	5 2	3 10	4.45	.	...
14	757	.735	.666	7008	71 4	76 1	70 7	73.13	+ 6 72	606	530	463	501	79	58	.61	.61	E b N	E b N	E b N	N 77 E	4 2	10.8	7.5	6.86	9.12	191	...
15	.566	498	486	5173	67 8	71 3	70.0	70 33	+ 3 85	570	648	.640	628	83	85	84	86	E b N	E S E	N	N 12 E	4 5	5 4	3.5	2 83	4.87	.137	...
16	.528	.546	546	5412	70 2	79 0	73.3	74 47	+ 7 88	608	738	719	687	82	76	87	.81	N w b N	s b w	s b w	N 89 w	1 3	7 0	1 4	1 32	3 69	...	...
17	.689	.608	—	—	71 1	79 6	—	-	-	654	704	—		.87	69	—	—	s	s E	N w b w	s 55 E	0 5	6.0	0 4	1 88	2 48	.	...
18	.579	473	464	.5065	73 3	75 1	70 0	73 08	+ 6 40	685	744	654	663	84	.85	90	84	N W	E N E	s E b E	N 66 E	1 5	0 4	0 4	3 73	4 19	497	...
19	.483	340	345	3602	70 4	84 1	69.9	75 43	+ 8 65	693	770	528	675	93	65	75	77	Calm.	s b w	N w b N	N 84 w	0 0	5.0	3 4	2 09	4.82	...	...
20	.408	490	.583	.4987	68 9	73 3	69 7	67 33	+ 0 57	475	302	370	.370	67	36	75	57	N w b N	N w b N	Calm.	N 27 w	7 3	21 1	0.0	9.84	10 02		...
21	.631	568	479	5523	57 7	68.2	64.2	65 13	− 1.02	386	478	465	463	90	.69	77	73	Calm.	s	Calm.	s 28 w	0.0	1.0	0 0	1 10	1 27	.	...
22	.325	.270	.420	3392	67 5	76 1	61 0	68 27	+ 1 40	533	329	288	368	79	36	52	32	s w	w N w	N w b w	N 72 w	6 5	23 2	10 5	13 35	13.81	...	...
23	.518	537	576	5445	55 9	71.1	64.3	61 10	− 3 78	337	367	288	317	.76	.47	68	.39	w b N	w b N	Calm	N 61 w	7 5	14.0	0 0	6.65	6 70	.064	...
24	.584	.545	—	—	58 3	73.3	—	—	—	370	439		—	.82	.54	—	—	N b w	s	w s w	s 2 E	1 5	4.4	3.5	1 23	2 57	.069	...
25	.561	.539	585	5382	62 4	71.8	63.6	64 85	3 19	503	500	518	521	89	71	91	85	N N W	s	Calm.	s 87 w	2.3	5 6	0.0	1 14	4.07	879	...
26	.479	.502	554	5160	58 4	59.7	57 4	58 65	8 32	365	266	322	312	75	52	.68	64	N w b N	w b N	w	N 68 w	15 5	24.0	11 2	16 67	17.30	...	...
27	.670	.583	616	5918	57 0	66 4	56 3	60 08	− 6 90	317	342	348	335	68	52	.77	65	N W	N W	N W	N 40 w	11 8	17.4	4.6	12.33	12.38	...	...
28	.631	.634	.683	6523	57 0	69.6	60.2	62.27	− 4 70	.372	387	330	372	.80	53	.63	.67	N W	s w b s	N b w	N 44 w	14 8	11.4	8 4	6 44	7.40	.051	...
29	.790	.768	.703	7723	57 9	70.7	58 8	63 65	− 3.30	.361	.450	371	392	74	.59	75	.67	N b w	s	Calm.	s 13 w	4 5	5.6	0 0	2 27	3 14	...	...
30	.751	741	681	7342	57 0	70 0	62.4	64.15	− 2 77	361	433	.362	.412	.77	59	.67	.66	s	E b s	E b N	s 61 E	0 5	6.5	1.8	3 24	3 53	...	...
31	.613	603	—	-	59 2	74.7	—	—	—	401	479	—	—	80	.56	—	—	s E b E	N	s	s 54 E	2.2	9.5	4.6	3 87	5.83	095	...
	[illegible]	29 6382	29 6442	29 6458	61.70	72 30	63.60	66.87	+ 0.69	.461	.496	.456	471	.75	.61	.75	70	....	....	....	....	5 94	9 20	5 19	......	5.51	2 611	...

Highest Barometer . . . . 30.141 at 9 30 a. m. on 5th, } Monthly range=
Lowest Barometer . . . . 29.159 at 2 p. m. on 2nd, } 0.982 inches.

Self-registering Ther.:
Maximum temperature . . . . 88°0 on p.m. of 12th } Monthly range=
Minimum temperature . . . . 44°7 on a. m. of 4th } 43°3
Mean maximum temperature . . 74°65 } Mean daily range = 15°45.
Mean minimum temperature . . 59°20 }
Greatest daily range . . . . . . 24°3 from a. m. to p. m. of 1st.
Least daily range . . . . . . 4.3 from a. m. to p m. of 26th.

Warmest day . . 12th ... Mean Temperature . . . 79°88 } Difference=24°80.
Coldest day . . . . 4th ... Mean Temperature . . . 55°08 }

Maximum { Solar . . . . 103°0 on p. m. of 19th } Monthly range=
Radiation { Terrestrial . . . . . . 34.3 on a. m. of 1st } 67°7.

Aurora observed on 4 nights, viz.: 11th, 23rd, 28th, and 29th; possible to see Aurora on 21 nights; impossible on 10 nights.

Raining on 12 days; depth, 2.611 inches; duration of fall, 39.9 hours.
Mean of cloudiness=0.46; most cloudy hour observed, 6 a. m., mean=0.51: least cloudy hour observed, 8 a. m., mean=0.36.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1649.65	1023.18	966.01	1876.41

Resultant direction, N 56° W; Resultant Velocity, 1.48 miles per hour.
Mean velocity of the wind 5.81 miles per hour.
Maximum velocity . . . 26.8 miles per hour, from 4 to 5 p.m. on 22nd.
Most windy day . . . . 26th—Mean velocity, 17.30 miles per hour.
Least windy day . . . . . . 21st—Mean velocity, 1.27 do
Most windy hour, noon to 1 p. m.—Mean velocity, 9.71 do } Difference
Least windy hour, 8 to 9 p. m.- Mean velocity, 2.68 do } 7.03 miles.

1st. Thunderstorm, vivid lightning and heavy rain, from 11.30 p. m.
2nd. Thunderstorm and slight rain from noon to 3.25 p. m.
5th. Imperfect solar halo and parhelia at 6.40 p. m.
11th. Distant Thunder at 5.30 p. m.
12th. Distant Thunder in West at 4.45 p. m.
13th. Distant Thunder in S. W. at 5 p. m.
15th. Thunderstorm from 4 to 5.30 a. m., and again from 1.30 to 3.30 p. m.—Perfect rainbow at 4.55 p. m.
17th. Dense fog at 4 a. m.
18th. Thunderstorm from 0.30 p. m., with but little intermission to 8 p. m.
19th. Dense fog 6 to 7 a. m.
21st. Slight ground fog 5 to 6 a. m.

26th. Thunderstorm 2 to 5 p. m.—Perfect double rainbow at 4 p. m., and sheet lightning round horizon from 10 p. m. to midnight.
28th. Imperfect double rainbow 6 to 7 p.m.—31st. Distant Thunder in N.W. at noon.
Heavy Dew recorded on four mornings during the month.

The Resultant Direction and Velocity of the Wind for the month of July, from 1848 to 1859 inclusive, were respectively N. 63° W., and 0.28 miles.

The mean temperature of July, 1859, differed but little from the average of the last 20 years, the depth of Rain recorded was 0.879 inches on the surface less than the mean of the same number of years, and the mean velocity of the wind was 1°08 miles per hour in excess of the average of 12 years.

COMPARATIVE TABLE FOR JULY.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity.
	°	°	°	°	°					°		
1840	65 6	— 1 8	79 4	48.2	31 2	6	5.270	..	...	..	...	
1841	65 0	— 2 1	86 3	43 2	43.1	10	8 150	...	...	..	...	0.27 lbs
1842	64.7	— 2.4	90 5	42.0	48.5	4	3.050	.	..		..	0 33 "
1843	64 5	— 2 6	86 1	40 2	45 9	8	4.605	...	...	...	...	0 44 "
1844	66 0	— 1.1	86 1	40 5	45.6	12	2 815	...	...	...	.	0.19 "
1845	66 2	— 0 9	94.6	45 6	49 0	7	2.195	...	...	...	...	0.30 "
1846	68 0	+ 0.9	94.0	44 9	49.1	9	2 895	...	...	.	...	0 29 "
1847	68 0	+ 0 9	87 5	43 8	43 7	8	3 355	...	..	..		0 19 "
1848	65 5	— 1 6	82 7	46.7	36.0	10	1 890	...	...	N 14 W	0 18	4 94 ms.
1849	68 4	+ 1.3	89 1	51 0	38.1	4	3 415	...	.	S 5 W	0 75	3 52 "
1850	68 9	+ 1.8	84.9	52 8	32 1	12	5 270	...	.	N 81 E	0 69	4.56 "
1851	65 0	2 1	83.7	52 1	30.6	12	3 625	..	...	N 60 W	0.68	4 13 "
1852	66 8	— 0 3	90 1	49.5	40.6	8	4 025	...	..	N 43 W	0.93	3.38 "
1853	65 6	— 1 5	85 4	49 4	36.0	10	0 915		...	S 58 E	0 24	3.69 "
1854	72.5	+ 5.4	93 6	53.0	40 6	9	4 805	...	..	S 49 W	0 37	4.03 "
1855	67.9	+ 0 8	88 4	53.1	35.3	13	3 245	...	...	S 19 W	0 73	3 47 "
1856	69 9	+ 2 8	92 0	51 4	40 6	8	1 120	...	..	N 79 W	1 57	5 84 "
1857	67.8	+ 0 7	85.4	52 4	33.0	15	3 475	..	...	S 68 E	0 81	4 74 "
1858	67.9	+ 0.8	83.4	55 9	27.5	13	3 072	...		N 15 E	1.13	5 76 "
1859	66.9	— 0.2	87 7	50.5	37 2	12	2.611	...	...	N 56 W	1.48	5 81 "
Mean	67 08	...	87.49	48.31	39.19	9.5	3.490	...	...	...		4.73

MONTHLY METEOROLOGICAL REGISTER, ST. MARTIN, ISLE JESUS, CANADA EAST—JUNE, 1859.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M. D., LL.D.

Latitude—45 deg 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32° 6 A.M.	2 P.M.	10 P.M.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	Tension of Vapor. 6 A.M.	2 P.M.	10 P.M.	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Velocity in miles per hour. 6 A.M.	2 P.M.	10 P.M.	Mean direction of Wind.	Rain in Inches.	Snow in Inches.	Weather, &c. A cloudy sky is represented by 10; A cloudless sky by 0. 6 A.M.	2 P.M.	10 P.M.
1	29.955	29.758	29.881	59.0	84.6	64.5	439	758	497	88	66	83	s s E	s b E	s w b s	0.11	3.61	3.72	...	.	.	Cu. Str. 10.	Clear.	Str. 3.
2	.724	620	701	64.0	78.1	69.6	440	678	496	75	73	70	w b s	s s E	w s w	5.42	6.50	12.83	...	0.270	..	Cir. Str 9.	Cu. Str. 8.	Clear.
3	.715	681	330	55.7	78.0	49.7	370	443	205	84	46	75	s	s E b E	N w	5.46	5.02	17.66	...	Inap	...	Clear.	Do. 6.	Str. 2.
4	.920	942	970	41.9	48.1	45.0	169	215	211	65	60	72	N b E	w b s	s b w	11.63	4.93	1.53	...	...	.	C. Str. 8.	C. C. Str. 8.	Clear.
5	.900	.876	950	41.8	58.0	51.0	169	255	203	65	53	55	N N E	s b w	w b s	12.96	6.31	4.03	...	..	...	Cir. Str. 4.	Do. 8.	Cir Str. 4.
6	.906	.904	964	50.3	73.6	59.0	283	469	275	78	57	56	s w	w s w	s w	6.63	10.93	7.48	...	...	...	Clear.	Cirri 2.	Clear.
7	.996	948	861	47.0	84.0	64.0	278	607	440	85	.53	77	w b s	w s w	w N w	2.63	1.81	3.62	...	...	...	Do.	Clear.	C. C. Str. 9.
8	.813	847	532	58.1	69.4	84.0	400	590	328	84	85	77	s b w	w b s	w N w	6.07	12.18	14.42	...	0.963	..	C. C. Str. 10.	Rain, thund.	C. Str. 4.
9	.759	.696	.742	42.1	62.9	52.0	222	455	204	83	58	69	w b N	sw b w	s w	18.63	8.80	4.11	...	..	.	Clear.	Cirri Str. 4.	Str. 2.
10	.848	644	802	52.3	50.9	48.4	338	233	121	83	78	48	w b s	w s w	N w	1.86	6.09	10.46	...	0.263	...	C. Str 10.	Cirri Str. 8.	Clear.
11	.990	.981	30.007	40.2	53.2	43.0	173	194	199	73	48	74	W N W	W N W	w N w	8.37	14.42	6.21	...	.	.	Clear.	C. C. Str. 8.	Do.
12	30.067	.997	29.810	42.6	62.4	55.6	.206	263	288	78	48	.65	s s w	w s w	w b N	0.00	4.43	7.98	...	..	.	Cirr Cum. 6.	Do. 10.	C. C. Str. 6.
13	29.741	600	.741	57.2	60.4	60.3	.360	402	.487	.75	.91	94	s	s b W	s	13.60	8.47	3.00	...	0.273	...	C. Str. 9.	Rain,	C. Str. 10.
14	.808	.760	810	52.2	69.5	69.2	282	430	439	73	61	86	N E	s	s s w	10.01	1.81	0.22	...	.	..	Do,	Cu. Str. 6.	Cirr Cum. 4.
15	.750	.676	.516	63.0	86.8	68.0	478	850	642	83	88	92	s	s w b s	s w	0.03	8.53	12.26	...	1.830	...	C. C. Str. 8.	C. C. Str. 10.	Rain.
16	.801	679	.789	67.2	68.2	57.8	591	426	.429	89	91	91	w b s	N E b E	s w	5.83	5.15	1.46	...	0.990		Cu. Str. 6.	Rain.	C. Str. 9.
17	.819	901	.832	50.0	68.7	58.2	265	261	305	75	38	.76	E b N	E b N	N E	3.90	2.47	2.80	...	...	...	Clear.	C. C. Str. 6.	Do. 10.
18	.641	.682	.800	62.2	68.4	56.1	361	543	385	93	79	84	N E b E	s w	w b s	13.60	1.22	7.32	...	1.364	...	Rain.	Cu. Str. 8.	Clear.
19	.894	.734	897	55.0	75.0	61.0	308	519	390	74	60	.74	w s w	w s w	w s w	0.90	5.96	3.92	...	...	...	Clear.	Clear.	Clear.
20	.574	776	710	51.0	75.2	60.2	277	600	466	79	77	88	s w	s w	E b s	5.97	1.47	3.16	...	...	...	Do.	C. C. Str. 8.	C. Str. 10.
21	.601	.459	.601	59.1	64.3	62.5	476	508	491	97	86	88	s s w	s s w	s s w	1.62	4.62	4.17	...	0.240	...	Cu. Str. 10.	Cu. Str. 8.	Do. 8.
22	.898	612	800	57.0	68.6	61.0	385	.509	419	84	75	.80	w s w	w s w	s w b w	2.87	8.72	3.62	...	...	...	Do. 8.	Do. 6.	Do. 2.
23	.897	.890	.984	61.4	83.0	62.2	440	664	542	.85	62	.87	sw b w	s s w	s b w	0.80	1.40	0.82	.	...	...	Clear.	Cirr. 4.	Clear.
24	.959	.914	.931	61.0	66.3	61.0	456	462	480	88	87	91	s E	s E	s b E	0.06	0.92	0.12	...	0.230	...	Cu. Str. 10.	Cu. Str. 10.	C. Str. 10.
25	.759	.702	.788	58.1	75.8	61.7	452	628	436	94	73	80	N N E	w s w	w	0.00	2.03	4.46	...	Inap	..	Do. 10.	Do. & Thun.	Clear.
26	.660	614	918	65.3	83.4	69.0	528	687	502	84	56	72	s w	w s w	w s w	1.22	2.15	4.61	...	...	...	Clear.	Cirr. 2.	Do.
27	.964	840	.774	67.0	89.6	73.0	378	855	562	81	.68	.70	s w b s	s b w	s b w	1.47	3.96	8.01	...	...	...	Do.	Cu. Str. 4.	Str. 2.
28	.772	.786	.817	75.0	84.5	77.0	751	748	758	86	94	.88	w N w	N w	sw b w	14.22	10.95	3.97	...	0.210	...	Cumulus 10.	C. C. Str. 4.	Do.
29	.575	.488	.550	79.0	89.0	70.6	.372	764	696	78	56	.96	w s w	s w bw	N w b N	8.67	13.65	10.96	...	Inap	...	C. C. Str. 8.	Rain and th.	Cu. Str. 10.
30	.677	.714	866	50.0	68.0	57.6	.260	.310	.342	.82	.47	.69	w	w	w	14.40	[illegible] 84	0.67	...	0.176	...	Cu. Str. 10	Clear.	Clear.

(NINE MILES WEST OF MONTREAL.)

BY CHARLES SMALLWOOD, M.D., LL.D.

Latitude—45 deg. 32 min. North. Longitude—73 deg. 36 min. West. Height above the Level of the Sea—118 feet.

Day.	Barom. corrected and reduced to 32°			Temp. of the Air.			Tension of Vapour.			Humidity of Air.			Direction of Wind.			Velocity in miles per hour.			Rain in Inches.	Snow in Inches.	WEATHER, &c. A cloudy sky is represented by 10; A cloudless sky by 0.		
	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.	6 A.M.	2 P.M.	10 P.M.			6 A.M.	2 P.M.	10 P.M.
1	29.881	29.830	29.782	58.0	74.8	61.0	.352	.396	.419	.70	.48	.80	w s w	w s w	w s w	2.23	6.41	5.50	.	..	Clear.	Clear.	Clear.
2	.534	.463	.380	67.2	81.8	72.2	.591	.773	.675	.89	.71	.88	s s w	s s w	w s w	1.47	5.74	15.32	Inap.	..	Cu Str. 10	C. C. Str. 10.	Cirri 2.
3	.580	.700	.895	55.4	62.4	50.1	.259	.284	.225	.68	.61	.64	N b w	N b w	N N E	12.22	7.60	4.22	...	..	Do.	Do. 6.	Clear.
4	30.041	30.116	30.134	49.0	65.7	54.9	.212	.319	.166	.60	.47	.42	N N E	s s E	s s w	6.93	3.52	0.44	...	...	Clear.	Clear.	Clear.
5	.204	.175	.292	45.4	60.2	61.0	.269	.599	.419	.88	.59	.80	s s w	s b w	s b w	0.00	0.00	0.30	...	...	Do.	Do.	Str. 2.
6	.134	.125	.038	64.2	65.0	67.2	.464	.650	.463	.77	.64	.71	s s w	s s w	s s w	0.08	2.08	0.21	...	...	Do.	Do.	Clear.
7	.047	29.959	29.880	65.0	76.7	67.5	.471	.577	.522	.81	.64	.79	s s w	s w	s w	1.82	2.42	0.42	...	..	C. C. Str. 8.	C. Str. 10.	C. C. Str. 4.
8	29.948	.896	.914	64.3	59.2	66.3	.529	.572	.556	.89	.52	.84	s w	w b s	w b s	0.00	0.93	1.60	..	...	Do. 4.	Cir. Cum. 4.	Cirri 2.
9	30.012	30.003	30.035	64.5	81.1	67.0	.398	.547	.403	.68	.52	.71	E	N N E	s s E	2.98	2.55	0.72	...	...	Clear.	Cirri 2.	Clear.
10	.046	.009	29.992	70.1	88.5	72.0	.632	.670	.385	.73	.47	.63	s s w	s b E	s s E	0.43	3.03	4.66	..	...	Light Cirri.	C. C. Str. 6.	C. C. Str. 8.
11	29.851	29.762	.869	64.6	90.0	78.9	.427	.751	.785	.71	.53	.82	s b w	s s w	s s w	1.78	7.77	0.81	..	..	Clear.	Cu. Str. 5.	Cu. Str. 8. A.B.
12	.858	.757	.769	74.0	95.6	84.0	.691	.916	.789	.81	.56	.68	s s w	s s w	s b E	0.00	1.60	4.70	...	..	Do.	Clear.	Str. 4. Lightg.
13	.830	.962	.979	70.9	86.0	67.0	.651	.746	.406	.75	.64	.77	N N E	E b s	E s E	9.82	6.73	1.70	0.100	..	Cu. Str. 8.	Do.	Clear.
14	.957	.998	.998	66.1	62.0	65.2	.509	.432	.483	.75	.40	.76	E s E	N E b E	N	1.22	3.82	1.00		..	C. C. Str. 4.	Do.	C. C. Str. 6.
15	.888	.774	.666	68.9	79.0	66.3	.536	.651	.670	.77	.66	.89	N E b E	s E	s E	1.10	4.56	10.06	Inap.	...	Cir. Str. 4.	Cu. Str. 10.	Cu. Str. 9.
16	.719	.710	.728	65.9	67.9	70.1	.520	.670	.626	.78	.53	.88	s E b s	s s E	s b w	6.09	14.22	0.98		..	Cu. Str. 10	C. C. Str. 6.	Do. 10.
17	.783	.757	.699	70.1	77.1	71.4	.556	.639	.696	.84	.69	.80	s w	s s w	E	1.10	8.13	0.41	0.110	...	Clear.	Cu. Str. 6. Th.	Clear.
18	.899	.596	.594	67.9	80.9	68.2	.563	.638	.681	.87	.62	.87	E b s	s s E	s E b E	1.31	0.71	0.00		...	Do.	Cu Cir. 8.	Cu Str 8.
19	.889	.480	.396	67.9	93.1	77.0	.563	.814	.685	.87	.54	.75	E b s	s s E	s s w	0.66	9.18	1.53	...	...	Do.	Cirr 6.	Do. 9. Thund.
20	.396	.493	.683	63.0	67.0	52.1	.520	.425	.534	.88	.64	.88	N w	N b w	w b N	5.46	16.02	13.00	0.170	...	Cu. Str. 10.	C. C. Str. 4.	Clear
21	.677	.595	.663	60.0	75.6	64.1	.360	.484	.464	.68	.58	.77	w s w	w	w s w	0.36	0.80	7.32	..	...	Clear.	Cu. Str 6.	Cu. Str. 8.
22	.467	.328	.432	63.0	63.0	67.2	.485	.401	.378	.96	.88	.85	s s E	w b s	N w b w	1.11	0.38	3.48	0.218	...	Cu. Str. 8.	Do. 8.	R'n, with thu.
23	.560	.654	.674	56.4	80.4	60.1	.381	.529	.335	.74	.75	.78	N N w	w	w	7.79	5.65	2.30	0.060	...	Clear.	Do. 4.	Clear.
24	.719	.747	.704	48.4	76.1	62.2	.285	.470	.406	.85	.52	.74	w	w s w	s w b s	10.00	14.57	6.46	.	...	Do.	Do. 4.	Str. 2.
25	.794	.660	.747	60.6	79.9	57.0	.456	.465	.407	.88	.47	.87	s s E	s	s b E	0.00	2.07	5.81	.	...	C. C. St. 8.	Do. 6.	Clear.
26	.634	.584	.578	60.0	62.2	53.8	.469	.540	.374	.94	.97	.93	E s E	s E	w s w	0.11	0.38	7.03	1.780	...	Fog.	Rain.	Cu. Str. 10.
27	.477	.474	.507	58.2	65.1	58.8	.324	.420	.446	.86	.68	.91	w b s	N N w	w b N	4.80	6.95	14.57	Inap.	...	C. C. Str. 8.	Cu. Str. 10.	Clear.
28	.654	.690	.704	63.2	75.9	57.9	.478	.510	.436	.85	.63	.94	w b s	w s w	s w	3.76	5.00	5.56	...	...	Do. 8.	Do. 4.	Str 2.
29	.902	.829	.939	60.8	80.6	63.6	.503	.598	.536	.95	.50	.92	s w	s s w	s s w	0.15	0.75	0.40	...	...	Cirr. Str. 4.	Do. 8.	Clear. Au Bo.
30	.962	.906	.892	64.7	87.0	69.9	.523	.557	.459	.86	.45	.79	s s w	s	s E b E	0.17	0.26	0.26	...	...	Clear.	Clear.	Do.
31	.973	.863	.791	63.1	90.0	69.1	.489	.68	.584	.91	.42	.79	E s E	s E b E	E s E	0.00	0.22	1.67	...	...	Cirr. 2.	Do.	Do.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR JUNE, 1859.

arometer	Highest, the 10th day	30.097
	Lowest, the 29th day	29.426
	Monthly Mean	29.784
	Monthly Range	0.671
Thermometer	Highest, the 27th day	91°0
	Lowest, the 12th day	31°1
	Monthly Mean	62°0
	Monthly Range	59°9

Greatest Intensity of the Sun's Rays .... 101°4

Lowest point of Terrestrial Radiation .... 24°2

Mean of Humidity .... .706

Amount of evaporation 2.89

Rain fell on 14 days, amounting to 6.779 inches; it was raining 48 hours and 30 minutes, and was accompanied by thunder on 5 days.

Most prevalent wind, the W.

Least prevalent wind, E. by S.

Most windy day, the 30th day; mean miles per hour, 14.84.

Least windy day, the 24th day; mean miles per hour, 0.33.

Aurora Borealis visible on 0 nights.

The electrical state of the atmosphere has indicated high tension.

Ozone was present in rather large quantity.

Solar Halo on the 12th day.

Frost on the 5th, 6th, 11th and 12th days.

REMARKS ON THE ST. MARTIN, ISLE JESUS, METEOROLOGICAL REGISTER FOR JULY, 1859.

Barometer	Highest, the 5th day	30.292
	Lowest, the 22nd day	29.382
	Monthly Mean	29.815
	Monthly Range	0.864
Thermometer	Highest, the 12th day	97°7
	Lowest, the 4th day	36°1
	Monthly Mean	67°58
	Monthly Range	61°6

Greatest intensity of the Sun's Rays .... 110°1

Lowest point of Terrestrial Radiation .... 27°3

Mean of Humidity .... .705

Amount of evaporation .... 3.61 inches.

Rain fell on 9 days amounting to 2.428 inches; it was raining 15 hours 35 minutes, and was accompanied by thunder on 7 days.

Most prevalent wind, S. W.

Least prevalent wind, E.

Most windy day the 24th day; mean miles per hour 11.34.

Least windy day the 5th day; mean miles per hour 0.61.

Aurora Borealis visible on 2 nights.

Parhelia on the 9th day.

Frost on the 4th and 5th days.

The electrical state of the atmosphere has indicated high tension.

Ozone was present in moderate quantity.

ABSTRACT OF METEOROLOGICAL REGISTER, UNIVERSITY OF QUEEN'S COLLEGE, KINGSTON, CANADA WEST, FOR 1858.

Latitude North, 44° 13′ 30″. Longitude West, 76° 30′ 1″. 294 feet above the level of the Sea.

1858. MONTH.	Barometer corrected and reduced to 32°.		Thermometer.		Tension of vapor.		Humidity.		Clouds.		Pressure of wind in lbs. avoirdupois.		Mean Maximum Temperature in Sun's Rays.	Mean Minimum Temperature on grass.	Mean Maximum Thermometer in shade.
	9½ A. M.	3½ P. M.	9½ A. M.	3½ P. M.	9½ A.M.	3½ P.M.	9½ A.M.	3½ P.M.	9½ A.M.	3½ P.M.	9½ A.M.	3½ P.M.			
January	29.760	29 719	25.56	28.28	.188	.159	826	870	6.0	6.0	604	532	36.86	15.17	32 90
February	29.695	29.668	13.57	19 00	.910	.116	.844	839	5.7	5.9	390	.415	31.47	3,38	30.78
March	29 616	29.599	26 60	31.80	.151	.175	823	817	5 0	5.4	435	.530	44 32	15.03	34.68
April	29 803	29 556	42 90	46.90	.237	.582	806	.815	5.4	6.2	415	.450	59 08	29.50	48 40
May	29.632	29.629	51.70	54 30	.289	308	711	.699	6 5	7.0	298	.320	67.60	37.50	58.20
June	29 665	29 599	66 80	69.70	.522	.675	786	.759	5.0	5 0	050	.080	79 20	52.10	71 70
July	29 690	29 649	68.40	72 00	577	036	828	816	5 8	5.3	064	.145	84.40	55.20	74.40
August	29 699	29.659	67 40	71.20	.573	.639	834	891	4.5	5.1	314	.413	84.20	49.50	73.40
September	29.755	29.685	60 60	64 30	445	375	803	.765	4.3	5.3	466	210	73.64	50.90	66.20
October	29.676	29.662	48.60	53.40	808	.330	837	806	6.1	6.9	.530	.360	65.30	39 00	56 90
November	29.663	29 628	31.60	34 30	.168	.191	829	850	7.9	7 9	460	370	44 28	26 70	37 06
December	29 813	29.732	22 50	24.80	129	.144	.803	.845	7 0	7.5	.750	.730	41.90	18.06	32.30
Sums	356 317	355.751	523 83	569.98	3.623	3 928	9.720	9 701	68.7	73 5	4 386	4.144	712.25	386 24	615.940
Means	29 693	29 646	43 65	47.50	.314	.327	.810	.808	5.7	6.1	365	.365	59 35	32 18	51.33

Highest Barometer, January 5th, 30.841. Lowest do., March, 21st, 28.976. Range of Barometer during the year, 1 505.—Maximum Temperature, 29th June, 86° .9. Minimum do., 19th February, —11.0. Range of Thermometer during the year 97.9.—Maximum in sun's rays with blackened bulb 4 feet above the ground, 29th June, 102° 3. Minimum on grass, 19th February,—14.0. Range during the year, 116.3.—Maximum pressure of wind, 21st March, 10.5 lbs. on square foot, or 31 miles per hour. Most windy month, December. Least do., June.—Most cloudy month, December. Least do., September.—Thunderstorms, 14.—Bay open, 2nd April.

ABSTRACT OF METEOROLOGICAL REGISTER, UNIVERSITY OF QUEEN'S COLLEGE, KINGSTON, CANADA WEST, 1858.—*(Continued.)*

Latitude North, 44° 13′ 30″. Longitude West, 76° 30′ 1″. 294 feet above the level of the Sea.

1858. MONTH.	Mean Minimum Thermometer in shade	Highest Temperature in shade.	Lowest Temperature in shade.	Monthly Range.	Highest Barometer.	Lowest Barometer.	Monthly Range.	Rain in inches.	Snow in inches.
January	17.20	47 8	-5 0	52.8	30 461	29.105	1 376	1.02	6.6
February	6.06	39 6	-11.0	50.6	30 218	29 040	1.172	0.00	14.5
March	19.00	49 8	-10 0	50.8	30 214	29 976	1 238	1 40	8.0
April	30.50	62 3	20 0	42.3	30 060	29 099	0 961	2 30	0.0
May	43.50	66.8	34 5	32.3	30 216	29 201	1 012	2 64	0.0
June	58.60	86 9	47 3	39 6	29 875	29 106	0 769	3 08	0.0
July	60.30	83.9	48 3	35 6	29 982	29 325	0 657	4.58	0 0
August	59 30	80 0	42.7	37.9	30 021	29 315	0.706	3 39	0.0
September	53 90	90.2	44.0	46 2	30 148	29 048	1 100	2 50	0.0
October	42.10	70.0	29.9	40.1	30 164	29 045	1 119	1 51	0.0
November	27 18	55.2	14 5	40.7	30 044	29 .338	0 706	1.10	2.0
December	15 00	56.9	-6.5	63 4	30 398	29.084	1 314	1.84	7 0
Sums	433.18							25.20	37.5
Means	36.10								

REMARKS.

The observations of the Barometer at half-past nine and half-past three give very nearly the maxima and minima of the day, and thus the mean for the year The observations of the Thermometer at the same times give the temperature a little higher than the mean of the year But the maxima and minima observations give the true mean within a few hundreths of a degree. Thus the mean of the observations at Toronto for the year 1858, taken at 6 a. m., 2 p. m., and 10 p. m., is 44° .74, while from the maximum and minimum thermometer is 44.71

The above observations are the first made at Kingston, which can be relied upon as accurate They have been made with standard instruments—the *Barometer* compared with that of the Royal Society of London, and the Thermometers constructed by Casella, the best maker, and furnished with certificates of comparison and correction from the Kew Observatory.

J. W.

Year.	Barometer at 9½ a. m., and 3½ p. m.	Thermometer. do.	Tension of vapor, do.	Humidity, do.	Clouds, do.	Pressure of wind, do	Mean of Maxim. and Min. Therm.	Highest Tem. in shade.	Lowest do.	Highest Temper on sun's rays.	Lowest do. on grass.	Highest Bar'r.	Lowest do.	Rain in inches.	Snow in inches.
1858	29.669	45.57	.314	.809	5.32	.355	43.71	86 9	-11.0	103 5	-14.0	30.461	28.976	25.02	37.5
1857	29 643	44.69	.318	.845	4.06	.316	46.07	85 5	-29 0	104-0		30.430	28.684	26 19	51.5
1856*	29.626	44.16	.310	.813	5.07	.64	42.65	88.5	-17.5			30.596	28.610	17.906	57.5

* Observations made in 1856 at 9 a. m., and 3 p. m.

THE CANADIAN JOURNAL.

NEW SERIES.

No. XXIV.—NOVEMBER, 1859.

THE QUIGRICH.

BY DANIEL WILSON, LL.D.,

PROFESSOR OF HISTORY AND ENGLISH LITERATURE, UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, 12th February, 1859.

In the year 1782, Mr. William Thompson, of Christ's Church College, Oxford, during a long vacation ramble in the highlands of Perthshire, was shown, at the village of Killin, on the banks of Loch Tay, the *Quigrich*, or crosier believed to have anciently belonged to St. Fillan, who has bequeathed his name to the neighbouring Strathfillan, at the head of Glendochart, as well as to other points of local interest in that district of Perthshire. The Earl of Buchan was then organising the Society of Antiquaries of Scotland, which obtained a Royal Charter in the following year, and to him, accordingly Mr. Thompson communicated a notice of the curious relic, accompanied with a drawing, the rudeness of which he entreats the Society to excuse, it being only the hasty sketch of a traveller, meant to lead the Society to the possession of the original.* But in this intention the intelligent tourist indulged in hopes which were not destined to realization; and when the communication was at length

* Transactions of Soc. Antiq. Scot. vol. iii. p. 289.

printed in the Society's Transactions, it was accompanied with a note which told that "The owner of the relic afterwards emigrated to America, carrying the Quigrich with him." When engaged, some years since, in preparing "The Prehistoric Annals of Scotland" for the press,—little dreaming then of becoming a settler in Canadian clearings, but rather disposed to imagine myself in some special respects *adscriptus glebæ*,—I tried to recover the traces of this ancient Scottish relic, and learned that it still existed in the safe custody of its hereditary keeper, who was settled on a farm in Western Canada. Since then, unanticipated changes have afforded me opportunities for a careful inspection of this curious Scottish ecclesiastical memorial, now transferred to Canadian soil, and such notes, descriptive or historical, as I have been able to glean concerning it, may very appropriately find a place in the *Canadian Journal*, relative to a relic, which, though now Canadian, claims an antiquity some centuries older than the first discovery of the New World, with all that pertains to its chronicled history.

Notwithstanding the long proscription of all ante-reformation and episcopal relics in Scotland, it is surprising how many such have been devoutly preserved, and venerated with superstitious fervour, almost to our own day. In the first Scottish Covenant, the subscription of which was, so early as 1585, rendered obligatory on every graduate of the Scottish universities, the subscriber is made do declare, after long and due examination of his own conscience, that he "abhors and detests all kinds of papistrie, but, in special, the vsurpit authoritie of that Romane Antechrist, . . . his canonizatioun of men, worschipping of imagrie, relicques and crosses; . . . his prophane holie water, baptizing of belles, conjuring of spirits, crossing, sayning, anoynting, conjuring, hallowing of Goddis holie creatouris, with the superstitious opinioun joyned thairwith." Nevertheless, at Killin,—according to a former incumbent, *cell-linn*: the cell of the Saint's pool,—and throughout Glendochart and Strathfillan, at the close of the eighteenth, and even in the earlier years of this nineteenth century, faith in the virtues of the relics of Saint Fillan seems to have been scarcely less strong than, of old, in the sanctity which the Gaels of Strathfillan ascribed to their good Abbot in the seventh century.

Alexander Dewar, the present custodier of the Quigrich, writes in answer to queries submitted to him: "I do not remember where

St. Fillan lived, having come to this country [Canada,] in the year 1818, but he had been through Perthshire, and there are several places there named after him, such as Dun-fhaolin: the hill of St. Fillan, at the east end of Loch Earn, where women with sickly children used to attend on the morning of the first of August, and bathe them in a spring that rose at the foot of the hill, believing that there was some virtue in the water; and there they left some of the clothes they had had on the child. On the top of the hill there is the form of a large arm-chair cut out of the rock, where St. Fillan sat and preached to the people. There is likewise, in Strathfillan, still standing, or at least was when I left Scotland, the walls of an old chapel, where people used to go with those who were out of their minds, and after dipping them two or three times in a deep pool of water that is in Uisge-fhaolin, they would leave them tied for the night in the old chapel, and such as got loose through the night they believed would get better, but those that remained bound were concluded incurable."

In this the Canadian custodier of St. Fillan's Crozier refers to a class of cures associated with the miraculous powers of another relic of the Saint, of which he appears not to have heard, though its associations are little less curious than those of the Saint's pastoral crook. Among the relics of the ancient Scottish and Welsh, as well as the Irish Churches, none appear to have been regarded with more devout or superstitious reverence than the portable hand-bells which are frequently associated with the name of some venerated and canonized ecclesiastic of the district to which they belong. Among the most prized relics of this class in the Museum of the Royal Irish Academy is the *Clog beanuighte*, which was believed to manifest its sympathy by a heavy sweating on the approaching demise of its custodiers; and Mr. John Bell, of Dungannon, thus describes, in a letter to me, a scene which he himself witnessed. "It was an ancient custom to place the bell near any of the Hennings [its hereditary custodiers,] when dangerously ill. I visited Mrs. Henning, the widow of Paul Henning, the last keeper of the *Clog beanuighte*, on her death-bed. She lay in a large, badly-lighted apartment, crowded with people. The bell, which had remained several days near her head, seemed to be regarded by those who were present with much interest. The vapour of the heated chamber was so condensed on the cold metal of the bell, that occasionally small streams

trickled down its sides. This 'heavy sweating' as it was termed, was regarded by every one with peculiar horror, and deemed a certain prognostication of the death of the sick woman, who departed this life a few hours after I left the room. The agonised bell, I was told, had on many previous occasions given similar tokens as proofs of its sympathy, on the approaching demise of its guardians." What gives a special value to this Irish hand-bell is the inscription on it, by which its era is believed to be fixed to the eleventh century, though Dr. Petrie assigns it to so early a date as the close of the ninth century. The inscription upon it is: *Oroit ar Chumascach m̄ ailello: i. e.*, A prayer for Chumascach Mac Ailello; who is believed to be Cumascach, Archbishop of Armagh, A. D., 1065.

The Scottish bell of St. Kentigern, the apostle of Strathclyde, after forming an object of devout veneration to the citizens of Glasgow for centuries, has its memorial still preserved in the city arms; and relics or records of at least a dozen such ancient holy bells of Scotland are still extant. The majority of them are rude square iron bells, coated with copper or bronze, and bearing a close resemblance to the cattle-bells which tinkle in the woods around our Canadian clearings, with no very musical or harmonious clank, unless when softened by distance and the intervening forest, or rendered grateful to the ear of the wanderer in "the bush," by the promise they give of some farm-house or settled clearing at hand. Nevertheless, to one of those: the bell of St. Ternan, the apostle of the Picts, was given the name of *Ronecht,* derived seemingly from the Gaelic *ronnaich,* a poet; *rannach,* a songster: however unmusical its *clogarnach* or jangling would sound in modern ears. The Ronnell bell of Birnie, still preserved at the Parish Church of Birnie, in the old Bishopric of Moray, and said to have been brought from Rome by the first bishop, is of the same rude character already described. It is a single sheet of hammered iron formed into a square bell, with the metal overlapped and rivetted at the joinings, after which it has been coated with brass. Yet this unmusical relic of the ancient bishops of the northern diocese, probably derives its name from the like fond ascription of dulcet sounds to its rude clangour.

Of this same class was the ancient relic of St. Fillan, which at a comparatively recent period bore a prominent part in the exorcisms already referred to by the present custodier of the Quigrich, by which the votaries of the Saint were wont to effect cures of madness and

the casting out of devils. The Rev. Patrick Stuart, parish minister of Killin, writing to Sir John Sinclair, in the latter part of the eighteenth century, observes: "There is a bell belonging to the chapel of St. Fillan, that was in high reputation among the votaries of that Saint in old times. It usually lay on a gravestone in the churchyard. When mad people were brought to be dipped in the Saint's pool, it was necessary to perform certain ceremonies, in which there was a mixture of Druidism and Popery. After remaining all night in the chapel bound with ropes, the bell was set upon their head with great solemnity. It was the popular opinion that if stolen it would extricate itself out of the thief's hands, and return home ringing all the way."* The virtues, however, of the ancient relic seem to have vanished along with the faith of simpler ages. In the beginning of our sceptical nineteenth century, an English antiquary carried off the ancient bell, without the Saint's interposition on behalf of his long-favoured strath, and its potent *clogarnach* has never since announced its return to St. Fillan's cell. The *Buidhean* or bell of Strowan, another and no less potent relic of the same old Scottish Abbot, has adhered with more fidelity to the scene of its ancient miraculous powers. Mr. McInroy of Lude, its present custodier, informs me that it is still a favourite popular legend in Strowan and Blair Athol, that the native of a neighbouring parish having stolen the *Buidhean* and fled with it, he sat down to rest on a large boulder, on the top of a neighbouring hill, laying the bell on the stone beside him, while he drew breath. On attempting to resume his journey, however, he found the bell immoveable; but no sooner did the affrighted and penitent thief turn his face towards Strowan, with the resolution of returning the abstracted relic, than it became once more portable, and was forthwith restored to its favourite resting place.

Such are some of the curious evidences of the sanctity with which the relics of St. Fillan were recently regarded in the district where early in the seventh century he bore his part in the introduction of Christianity into Scotland; and won the reputation for ascetic virtue long after celebrated thus under date of his martyrdom, in a calendar of Scottish saints, written in the early part of the sixteenth century, and now preserved in the library of the university of Edinburgh: *v. Idus Januarii.*—In Scocia Sancti Felani abbatis apud Strathfillane

* Sinclair's Statistical Accounts, xvii. p. 378.

qui a puericie primordiis tanta discipline regiditate carnem afflixit ut posterum sensualitatis et viciorum refrenendi motus preberet exemplum. Such also are some of the many traces of the uneradicated veneration for saints, holy bells and other sacred relics, in Presbyterian Scotland, upwards of two centuries after their solemn denunciation in the first National Covenant.

But other associations than such curious psychological phenomena, pertain to the Quigrich of St. Fillan, now transferred with its hereditary custodiers to Canada; though it too had its healing virtues and potent charms, long known and reverenced in the privileged districts of the Saint. It has its historical associations also, and these of a nature so singularly interesting for Scotland, that it seems to lose much of its value by being transferred to Canadian soil; and thus divorced from all those national and local feelings which confer on it so peculiar a charm. When endeavouring to recover traces of this Scottish relic, in 1850, I was favoured with a letter from the Rev. Æneas McDonell Dawson, whose own immediate ancestors were for a time the guardians of St. Fillan's Crozier, in which he remarked: "The celebrated Crook of St. Fillan is still in Canada, and in the keeping of the very family to whose ancestor it was confided on the field of Bannockburn, when the King, displeased with the abbot for having abstracted from it the relics of St. Fillan previously to the battle, from want of confidence, it is alleged, in the Scottish cause, deprived him of the guardianship."*

In this form of family tradition is preserved the recollection of an incident of the field of Bannockburn, thus referred to in Borland's 'Acta Sanctorum."† "During the night when Robert, anxiously bent on his affairs, enjoyed not a moment's rest, and revolving all things in his mind, was at length engaged with some of his friends in earnest devotion and prayer to God and St. Fillan (whose arm inclosed in silver he believed was with him in the army,) that they might be propitious to his victory, suddenly the silver arm, in which the real one was inclosed, appeared open, and in the twinkling of an eye was shut without any person touching or approaching it. This miracle being observed, the priest approached the altar to inspect it, when he saw the real arm within in, and exclaiming that the Divinity was certainly present, he confessed to the King that when he had

---

* *Vide* Prehistoric Annals, p. 665.

† Borland's Acta Sanctorum. Venice, 1734. De S. Fillano sine Philano.

formerly asked for the arm of St. Fillan he had given him the empty silver case, after taking out the relic, fearing it might be lost in the tumult. The King therefore, full of hope, spent the remainder of the night in thanksgiving and prayer." Hector Boece refers to this potent intervention on behalf of the Bruce. Camerarius also ascribes the victory to the same miraculous aid, speaking of it as "obtained by the intervention of divine assistance, Anno Chr. 1314, to St. Fillan's intercession for his countrymen;" but St. Fillan's legend disappears from the narrative of Major and other later historians.

Other evidence, however, tends to confirm the faith maintained in the Scottish legend of the fourteenth century which ascribed the victory of Bannockburn and the national independence, to the arm of St. Fillan which wrought so marvellously for his people on that glorious day. Were it not, indeed, that the sainted Abbot—no longer heedful of Scotland in this faithless century of ours,—has allowed his favoured reliquary, as well as its humble chronicler, to be transported beyond reach of Scottish legend, tale, or chronicle: much curious illustration might be added to this memento of a memorable national event. But unfortunately the libraries of Canada are far from rich in such materials. Barbour has given due prominence to the picturesque narrative of Maurice, Abbot of Inchaffray, celebrating mass in sight of the Scottish army; and then, passing barefooted along the front of the kneeling host with his uplifted crucifix, exhorting them to win their liberty or die. It connects this historical incident of the field of Bannockburn with the marvelous interposition ascribed to the arm of the sainted Abbot of an older century, when we recall the fact that centuries thereafter, and until the dissolution of religious houses at the Reformation, there was a cell or priory, belonging to the Abbey of Inchaffray, in Strathern, near the miraculous pool of St. Fillan, "founded by King Robert the Bruce, and consecrated to St. Fillan, in consideration of the assistance he had from that saint at the battle of Bannockburn."*

Some curious and highly interesting notices of ancient Scottish Croziers and their hereditary custodiers, with charters of tenure of freeholds held in virtue of such trust, have been recovered by the researches of Mr. Cosmo Innes, Professor of History and Antiquities in Edinburgh University, and Mr. Joseph Robertson, another able

* Spottiswood's App. Hope's Minor Practicks, p. 424.

Scottish antiquary.* Episcopal memorials of the same class, recovered from more than one ancient tomb in the choirs of Scottish cathedrals, are figured or described in the "Prehistoric Annals of Scotland," along with other ecclesiastical relics connected with the early Scottish church.† One of those ancient Scottish Croziers, the relic of a favourite Celtic saint, and a memorial of the older cathedral of the See of Argyll: the Crozier of St. Moluac,—long held, along with a little freehold, in the Island of Lismore, the seat of the old Bishopric,—has been recently transferred to the Duke of Argyll, by the last "Baron of Bachul," as the hereditary keeper of the Crozier was called, from its Gaelic name of *Bachul Mohr*, or the Great Staff. In describing this relic, Mr. Innes adds: "The Baron Bachul's of Lismore, though an uncommon, is not a unique instance of such tenures in Scotland. There is charter evidence of a mere croft of land in Cowal being held in the fifteenth century as an appendage to the office of Keeper of the Crozier of St. Mund, the saint to whom Kilmun is dedicated. In this case the land or the tenure bears the name of Deowray—a name suggesting a similar office with that which gave the name *Deor* or *Jore* (modernised *Dewar*) to the hereditary Keeper of the Crozier of St. Phillan in Glendochart." To this also may be added, in illustration both of such tenure and name, the Holy Bell of St. Rowen, which still secures to the family of Dewar certain hereditary chartered rights in Monivaird ‡

If any such freehold pertained in ancient times to the *Doires* or *Dewars* of Strathfillan, in virtue of their trust, all traces of it have long disappeared. The English tourist to whom we owe the revived knowledge of the Crozier of St. Fillan,—which appears to have been altogether unknown to the authors of the Statistical Accounts of the Parish of Killin,—describes its owner in 1782, as *Malice Doire*, a day labourer. "The neighbours," he says, "conducted me to the envied possessor of this relic, who exhibited it according to the intent of the royal investment. A youth of nineteen, the representative of his father's name, and presumptive heir to the treasure, lay drooping in an outer apartment in the last gasp of a consumption;" and yet here was one who only wanted patrimonial lands to have claimed a prouder descent than any whose ancestry figure in the Ragman roll. The

* Proceedings of Soc. Antiq. Scot., vol. ii., pp. 12, 125.

† Prehistoric Annals of Scotland, p. 464.

‡ *Vide* Archæol. Scot., ii., p. 75.

present representative of those to whom the Bruce entrusted the custody of the sacred relic, has acquired a farm in Western Canada, and—more from want of faith in the fidelity of future heirs, than from himself undervaluing the hereditary trust,—is not unwilling to part with the relic, if he could see it transferred to safe keeping. He has hitherto named £500 as the lowest sum he was willing to receive for it; and at one time submitted to the Earl of Elgin, while Governor General of Canada, a proposition to take in lieu of this, two thousand acres of Canadian land to be apportioned among his sons, on learning that His Excellency, who claims the honors of the Bruce, coveted the precious heirloom. Since then he has expressed his approval of a modified scheme by which I have endeavoured to secure the deposition of this national relic in the Museum of the Scottish Antiquaries at Edinburgh, where it would possess an interest and value altogether wanting to it while it lies, as it has done for some time, safe but totally unheeded, in the strong room of a Canadian Custom House. Under this proposed arrangement the Keepership of the Crozier is to remain nominally with the Dewars,—to avert, it may be, the evil consequences said to have followed on a former occasion, when the custody was transferred to other hands. My correspondent, the Rev. Æ. McDonell Dawson, remarks in the letter already referred to: "This family lost possession of the Crozier for a time, having disposed of it for a sum of money to an ancestor of my mother's family, who adhered to the ancient faith.* Soon after this transaction, however, ceasing to prosper, and attributing their change of circumstances to their indifference to a sacred object that had been solemnly entrusted to them, they persuaded the purchaser, or rather the person who inherited the Crozier from him, to part with it in his favour."

In reply to my inquiries for family traditions or documentary evidence relative to the Crozier of St. Fillan, Mr. Dewar thus writes: "I am sorry to say that I can give you but little information concerning the Quigrich. My father came to this country in the year 1818; and in coming up the Ottawa river, met with an old Scottish gentleman, of the name of McDonald, with whom he left several old papers that he had concerning the Quigrich, which papers were never returned, as Mr. McDonald's house was burned soon after, and

* Mr. Alexander Dewar, the present owner, is a Presbyterian, as his immediate ancestors were.

the papers lost." Mr. Dewar, however, retains in his possession a copy of the royal investment granted to Malice Doire, one of his ancestors, by James III. in 1487, in confirmation of more ancient royal deeds by Robert the Bruce; and registered by the Lords of Council and Session, at Edinburgh, in 1734. In this royal investment,—endorsed on the back of the old copy in Mr. Dewar's possession: "Charter of King James anent possessing the Relic of St. Phillan, in favor of Malice Deore, 1488,"*—it is set forth that "For as mekle as we have understand that oure servitoure Malice Doire and his forbearis has had an Relick of St. Filane, callit the Quegrich, in keeping of us and oure progenitors of maist nobill mynde, quham G[d] assoleze, sen the tyme of King Robert the Bruys and of before, and made nane obedience nor answere to na persoun spir[ale] nor temporale in ony thing concerning the said haly Relick utherwayis y[n] is qteind in the auld infeftment thereof made and [grantit be oure said progenitouris. We charge you herefore] and commandis that in tyme to come ye and ilk ane of you reddy answere intend and do obey to the said Malice Doire in the peciable brooking and joising of the said Relick, and z[t] ye nain of you tak upon hand to compell nor distreze him to mak obedience nor answere to you nor till ony either bot alanerly to us and our successoures, according to the said infeftment and foundation of the said Relick. . . . And that ye mak him nane impediment, letting, nor distroubance in the passing with the said Relick throw the Countre, as he and his forebearis was a wont to do."†

The virtues ascribed to the Crozier of St. Fillan, in his native district, were of a most varied description. It was regarded as an effectual cure for fever, by administering, or sprinkling with water in which it had been dipped; and was no less infallible in cases of scofula, or the King's evil, by being rubbed on the affected parts. It was serviceable also as a charm for the discovery and restoration of stolen cattle; and generally in all cases of disease of such. On this point Mr. Dewar replies to my queries: "It is quite true that the relic was looked on as a charm, but since it came into my possession

* On the endorsement the date is given in Arabic numerals, 1488; in the deed itself it is "MCCCCLXXXVII, and of oure regne ye XXVII zere—sic subscribitur Jacobus R."

† The whole document is printed in the Archæologia Scotica, vol. iii. p. 290; but the copy in Mr. Dewar's possession, though old enough, differs sufficiently to indicate its being another than that seen in 1782. The portion in brackets, which is a blank in the MS, has been supplied from the printed copy, otherwise I have followed Mr. Dewar's MS.

I have not been much troubled with it in that way, except for diseases of cattle. Two men, who had sick cattle, came to get water of it for them; but I never inquired whether it cured them or not." On another point, also, he adds: "The meaning of the word Quigrich I do not know; neither do I know whether it is a Gælic word or not."

In the name *Quegrich*, by which the Crozier of St. Fillan is designated in the Charter of James III., I am inclined to suspect a descriptive memorial of its historical association with THE KING, as Robert the Bruce was, *par excellence*, long after the days of his Royal descendant James III. Possibly it compounds with *Righ*, an old form of *cuag*, and signifies the King's Crook; as it might well be designated after the miraculous interposition on the Bruce's behalf, recorded in the *Acta Sanctorum*. The proper generic name of such symbols of pastoral oversight and rule, has been made the subject of some difference of opinion. With the usual derivation of Crozier from F. *croix*, it has been assumed that this is properly the superior pastoral staff or cross. But while we have the Medieval Latin: *cambutta* for the crozier, we have the corresponding *crocia* for the pastoral staff; and it is more probable that our crozier, or chief-pastor's crook, is derived directly from the A.S. *cryc* Du. *crook*, equally with the shepherd's crook; as in the description of the Archdeacon, in the FRERES TALE of Chaucer:—

For smale tithes and smale offering,
He made the peple pitously sing;
For er the bishop hent hem with his crook,
They weren in the archedekens book.

In celtic Scotland, the simple latin *baculus* was converted into *bachul easpuig*, the bishop's staff; *bachul mohr*, the big staff; and the corresponding *bachall* is used throughout the ancient Irish M.SS., not only to denote the crozier of a bishop, abbot, or abbess, but also the penitential staff of a pilgrim; and it is much more likely that the pastoral staff of the Abbot and Apostle of Strathfillan resembled, in material as well as form, a primitive shepherd's crook, than that he bore about with him in his missionary wanderings among the wild Pagans of Loch Tay such a tempting relic as that which has so long helped to associate his name and fame with the scene of his early and self-denying labours. Again we find the crozier presented by St. Columba of Iona, to St. Kentigern, the first Bishop of Glasgow, de-

signated in Joceline's life of the latter, both by the term *baculus* and *cambo*, another form of the *cambutta;* while again at a later period it reappears in the accounts of the Scottish Lord Treasurer, in 1506, as *cabok*. The derivation, there can be little doubt, is from the Gaelic or Welsh *cam*, crooked, which enters into so many compounds, and from which, also, is no doubt derived the more homely *cammock*, or Scottish shinty, prohibited by Edward III. under its latinised form of *cambuca*, or *cambuta*.*

To St. Fillan's cabok a special name was given, though it probably represents the most usual form of the ornamental baculus or cambutta of the ninth and tenth centuries, and even of a later period. It is literally a beautiful and elaborately wrought shepherd's crook; and, whatever diversity of opinions may arise on other points, it cannot admit of a doubt that this fine example of early celtic art exhibits abundant evidence of belonging to an era long prior to that of the hero of Scottish independence. The accompanying lithographic plate—skilfully executed from a very careful drawing,—renders any elaborate description of its form or details unnecessary. The interlaced knot-work and other ornamentation is such as is already well known, especially on some of the beautiful silver and goldsmiths' work of early Irish art. The front is jewelled with a large oval crystal, set on a plate which appears to have been moveable, and probably hinged, though it is now somewhat roughly secured, so as no longer to admit of being opened. This may have been the lid by which the bone of the Saint was inserted in the favoured reliquary; and which, according to the legend preserved in the "Acta Sanctorum," suddenly appeared open as it stood on the altar in the Bruce's tent, and reproached its faithless guardian with his unpatriotic deceit. Above this, and forming the front of the crest or ridge, is a figure, or bust, of an ecclesiastic, most probably designed for the Saint himself, while the lower end of the ridge terminates in the form of a snake's head, common on bronze relics of a late period. On the flat shield-shaped point of the crook, is a rude but bold engraving of the crucifixion, with two stars in the field, one on each side below the arms of the cross. The whole is of silver gilt, wrought on a hollow core of copper, and measures nine and a quarter inches in height, and nearly seven and a half inches across, from the point of the crook. It will be seen that it differs considerably, both in form

* Strut's Sports and Pastimes, B. II. c. iii. Goff, Cambuc, &c.

and details, from the sketch furnished to the Scottish Antiquaries in 1785, and copied in the Prehistoric Annals of Scotland, with an authentication of its general accuracy, on the authority of a correspondent at whose request the original had been inspected in its new Canadian reliquary. In its general form it most nearly resembles the head of the short episcopal cambutta borne by St. Luke, in the beautifully illuminated Gospels of MacDurnan, in the Library at Lambeth Palace, which have had the middle of the ninth century assigned as their date.* It is an exceedingly simple form, suggestive of a primitive age of art, and yet adorned with such rich and tasteful skill as to constitute—apart from its singularly interesting historical associations,—a valuable example of the workmanship of the early age to which it must be assigned, and of the primitive civilization which followed in the wake of that Christianity taught by St. Fillan and other Christian missionaries, to the first converts from among the pagan Celts of North Britain.

This ancient Scottish relic is still in the possession of Alexander Dewar, the lineal representative, in all probability, of the favoured follower of King Robert, to whom, according to no improbable tradition, it was confided on the field of Bannockburn, five hundred and forty-five years ago. Could the protection which the prejudices and superstition, no less than the national and family pride of earlier generations, secured for it as a sacred and chartered heirloom, be guaranteed to it under the charge of a Canadian yeoman, its fittest place would still be in the keeping of the Dewars, to whose custody it was entrusted, under such remarkable circumstances, and who have been, through poverty and exile, faithful to their trust. But removal from Strathfillan to the clearings of the New World has broken the charm. It only remains in the keeping of its present custodier because no one has hitherto been found able or willing to pay the price he demands for the precious relic; and it is earnestly to be desired that, ere it is too late, it should be secured within the safe keeping of one of our great national collections, before, as apprehended by its former describer in 1785, it "find a ready passage to the melting pot;" or, like the documents which accompanied it to Canada, it perish in some chance conflagration, such as yearly consume hundreds of the frail wooden houses of Canadian settlers.

* Archæol. Journal, vol. vii. p. 20.

DESCRIPTION OF AN INTESTINAL WORM FROM THE DUODENUM OF THE WHITE FISH OF THE CANADIAN LAKES.

BY BEVERLEY R. MORRIS, A.B., M.D.

Read before the Canadian Institute, 29th January, 1859.

ENTOZOA.

PARENCHYMATA.

Fam.: Acanthocephala. *Genus:* Echinorhynchus.
Species: .... ?

Description.—Body cylindrical, tapering to the tail. Procis subglobular, flattened anteriorly, armed with numerous recurved hooks, very difficult to count, but probably not exceeding twelve in number. Neck distinct nearly as long as the width of the tail. Digestive pouch doubly sacculated for half its length, which equals half the length of the whole body.

Colour—pale brownish yellow.

Length—one-fifth of an inch.

I found three specimens of this parasite adhering to the duodenal portion of the intestinal canal of a White Fish (*Caregonus albus*) of about two pounds weight, on the 5th of December, 1856. They were dead and partially decomposed, which rendered the examination less satisfactory than it would have been had they been alive. The form,

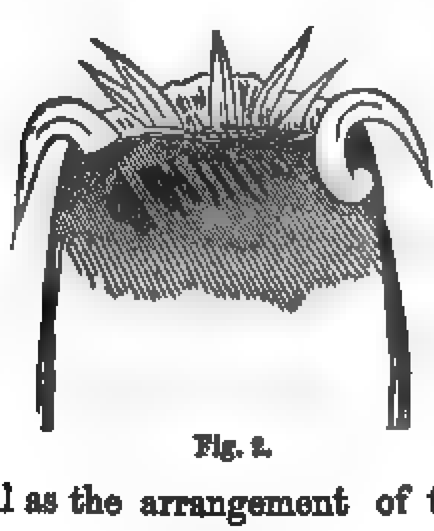


Fig. 2.

Fig. 3.

as well as the arrangement of the hooks (Fig. 2) is curious and is only to be seen by careful focussing when under the miscroscope.

One hook (Fig. 3) is cracked, and is interesting as showing an internal pulp cavity.

This parasite evidently belongs to the genus *Echinorhynchus;* but owing to not having access to books containing descriptions of all the known species of the genus, I am unable to say if it is new, or previously described. Possibly it may prove to be *E. fusiformis* which is parasite in the European trout; but I think it probable that as our White Fish does not occur in Europe, where the other species have been described, it may prove a distinct species. In this case I would propose the name of *E. Coregoni albi* as indicating the fish in which it is parasite.

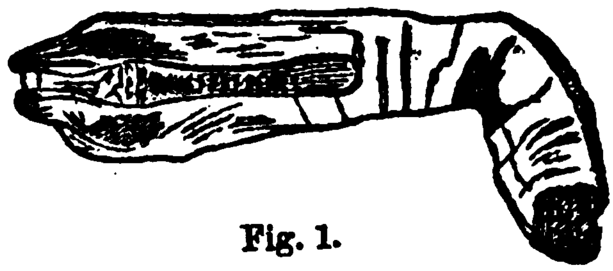


Fig. 1.

The accompanying wood-cuts have been engraved from carefully executed microscopical drawings, and suffice to convey a tolerably accurate idea of the most noticeable peculiarities of this intestinal parasite. Fig. 1 is on too small a scale to convey any very minute details, and especially fails to show the arrangement of the sacculi in two rows, at the head and upper portion of the stomach. It is sufficient, however, to illustrate the general form of the animal.

Fig. 2. Shows the arrangement of the hooks, and their form. Those appearing straight being seen edgeways.

Fig. 3 shows one of the hooks which was cracked, exhibiting an internal pulp cavity.

THE FAMILY OF FALCONIDÆ.

BY REV. W. HINCKS, F. L. S.

PROFESSOR OF NATURAL HISTORY, UNIVERSITY COLLEGE, TORONTO.

Read before the Canadian Institute, 11th December, 1858.

The notices I am about to lay before the Institute have occurred to me, in connection with efforts made to improve the collection of native birds in the museum of the University of Toronto. I have

been fortunate in meeting with specimens of a few rare birds, and in some instances the examination of species not peculiarly rare has led me to opinions differing somewhat from those most in vogue, or at least to doubts on points of some interest which I think it may be useful to record; whilst the interest felt in birds is so general as to justify the hope, that the subject will afford some entertainment to most of my readers.

What I shall now offer, will consist of an essay on the Canadian species of the family Falconidæ.

Throughout the Falcon family, great difficulty in rightly determining the limits of species arises from the changes occasioned in the same species by differences of age and sex, which often led the earlier naturalists and those who have collected specimens without reference to the birds in a living state, to multiply species improperly, whilst a desire to avoid this fault, with a partial knowledge of the facts, has led some moderns as it seems to me, conjecturally to unite really distinct birds, as varying conditions of the same species. I should be presumptuous if I hoped entirely to escape these opposite dangers myself, but I have cautiously endeavoured to find the right mean, and the suggestion of doubts for which there is even an apparent justification, may at least be useful in directing inquiry, or leading experienced observers to communicate the grounds for satisfactory decision.

Mr. Gray, possibly carrying subdivision to an extreme, ranges the FALCONIDÆ under seven sub-families. Of these, *Polyborinæ*, the vulture-hawks, nearly confined to South America, and *Milvinæ*, the kites, are unrepresented amongst us; unless indeed the beautiful swallow-tailed kite of the neighbouring States [Nauclerus furcatus] could be obtained within our borders. The remaining sub-families, Buzzards, Eagles, Falcons, Hawks and Harriers are all well represented.

The Buzzards, *Buteoninæ*, are known by their long wings, powerful feet, beak arched from its base, without tooth, or more than the slightest festoon, and even tail. The majority of these, form the Genus *Buteo*, whilst a few, with the Tarsi feathered to the foot are now named *Archebuteo*. The common buzzard, [Buteo vulgaris] is given by Sir J. Richardson, in Fauna Bor. Am., as a native of the fur countries, but it is now supposed, that his specimens belonged to *B. borealis*, an undoubted North American species. Of this latter, under which Mr. Gray includes several seemingly distinct forms, I can say nothing at present, as I am not so fortunate as to possess a specimen.

B. lineatus, the name given to the red shouldered hawk of Wilson, is now extended to his Winter-hawk also. The late eminent naturalist, Charles Lucien Buonaparte, Prince of Canino, promulgated the opinion that the red shouldered hawk, is the young male of the Winter-hawk, to which view Gray and others have assented. It is with great hesitation I suggest a doubt in opposition to such authorities, but in the collection of the University, we have four examples of the Winter-hawk, two of them apparently well-grown, the others, which were shot together, seeming to be a young pair considerably below the full size, yet all of them present precisely the characters of the Winter-hawk; whilst we have also a fair specimen of the red shouldered hawk, which looks like an older bird than the pair already noticed, and the markings of which differ so essentially in points usually to be relied upon, as the number and nature of the bars on the tail, that a strong presumption arises in favour of its being a distinct species. Accordingly I have thought it best for the present, to label only the red shouldered hawk, *Buteo lineatus*, and to mark the others, *Buteo hyemalis*, and I should be particularly glad of the aid of practical observers and sportsmen in settling the question. Of another rare species, Mr. Passmore has lately supplied us with a specimen, from this neighbourhood, *Buteo Pennsylvanicus*, the broad-winged hawk or buzzard, a bird discovered by Wilson, near Philadelphia, and less common than most of the tribe. Its moderate size, the comparative width of its wing, and the few white bars across its tail, serve to distinguish it.

Passing now to the genus Archebuteo, we find that Mr. G. Gray, in "the Genera of Birds," considers *Archebuteo lagopus* as belonging exclusively to Europe, and refers all the American birds to *Archebuteo Sancti-Johannis*. Not doubting but that this opinion is founded on a careful consideration of evidence, and having before me a good set of specimens, I have endeavoured to make out his reasons, but I cannot satisfy myself. It is true there are authorities, both English and American, for very dark birds, supposed to be of advanced age, being occasionally seen amongst the others, and the wings of our European specimen seem to be longer than those of the American; but most persons looking at the European and American birds in their lighter suit, would pronounce them one species. It seems certain that this is their full ordinary plumage, as they are known to breed in it, and the darker birds are much rarer in America and still more remarkably in Europe. If the striking difference of colour does not mark a species,

but is only a variety, or an effect of age, it may be necessary to suppress *A. Sancti-Johannis* altogether, unless indeed the length of the wing furnishes a better character. In our specimens, the fine light-coloured pair, lately shot on the Island, are, like the European bird, which they so much resemble, marked *A. lagopus*, whilst the fine dark plumaged bird, the true black hawk of American writers, is labelled *A. Sancti-Johannis*. These names were attached under the impression that I could at least maintain with some confidence, that, if the two species are good, we have both in America, but since I have noticed the apparent difference in the length of the wing, and one or two minor distinctions, I find myself as much in doubt as ever. These birds need more study of their habits and anatomical characters, as well as of the changes of colour they pass through.

Proceeding to the sub-family *Aquilinæ*, eagles, I have great pleasure in naming the Golden Eagle, *Aquila Chrysaetos*, as a denizen of our country, several of these noble birds having during the present winter been killed in the neighbourhood, of which we have been able to place a fine specimen in the museum. It has been seen near the Rocky Mountains, in Labrador, and as a rare visitant in various parts of the United States, but always so uncommon as when obtained to be deemed a prize, and as one of the noblest of the feathered race it cannot fail to be admired. Our specimen shows the form known as the ring-tail, and formerly accounted a distinct species. Being the youngest form it is the most common, as large numbers are not permitted to reach maturity, and a doubt has been sometimes raised whether it is not the only one seen in North America. The White-headed Eagle, *Haliætus leucocephalus*, is a more familiar bird, of a less bold and fierce character. It also undergoes a change of colour which has caused another suppositious species, for the young is entirely dark-coloured, or only irregularly sprinkled with white, whilst the fully matured bird has the colour on its head and tail in curious contrast with its dark body and wings.

Pandion Haliætus, the Osprey or Fish-Hawk, belongs to this group, but needs no special remark.

I have not heard of the Washington Eagle being found in Canada, but it may possibly occur to us.

Next in order come the *Falconidæ*, or true Falcons, the most typical form of the family, known by the length and power of the wings, the strength and sharpness of the claws, the presence of one

or even two teeth on each mandible, with a peculiar mode of flight and of seizing its prey. This interesting group is not largely represented amongst us. I have lately seen the Gerfalcon named as shot near Toronto, but I cannot help supposing some mistake. Its most southern limit, according to Richardson, is about the northern boundary of Canada, besides that it is seldom found far from the seacoast, I can only say that I should be most happy to receive it as a native bird. The peregrine falcon (*Falco peregrinus,*) is thought to be found here, but some American naturalists maintain that ours is an analogous species which they have called *Falco anatinus.* The structure, figure, and colouring of our bird, well-known as the great footed hawk, greatly resembles the European. If there is any difference it is most difficult to discover, and we ought not to multiply species wantonly. I hesitate therefore to admit the claims of this American species. Two others we have, which are peculiar to North America, and which illustrate separate generic forms. *Hypotriorchis Columbarius* the representative of the European merlin and one of our commonest falcons, and *Tinnunculus sparverius,* the American Sparrow-Hawk,—a well-known and handsome bird—the smallest of the whole family in this country.

In the sub-family *Accipitrinæ,* the Hawks,—using that term in its strictly limited acceptation, distinguished from the preceding by having only a festoon on the upper mandible, and by a different mode of seizing their prey, by a swoop off the ground or near to it, instead of a sudden descent in the air,—we have several good native illustrations.

I have lately had the great satisfaction of receiving from Mr. Passmore, *Astur atricapillus,* the American gos-hawk, and of thus satisfying myself by careful comparison with our European specimen of the common gos-hawk, *Astur palumbarius,* of the reality of the alleged specific differences. Our specimen is a very beautiful one, and we possess also what is thought to be the young bird, the markings of which are strikingly different and show the extent of the changes for which we have sometimes to make allowance. My receiving very recently a much larger and seemingly well grown bird, with precisely the same plumage as this young one, has created a doubt in my mind whether its history is well understood.

Accipiter Cooperi, called by Audubon the Stanley Hawk, is one of our commonest raptorial birds, and I have received it likewise from

South America, so that it is widely diffused over the continent. We have also *Accipiter fuscus*, the sharp-shinned hawk, in which the superior size of the female is more conspicuous than in most species.

It remains for me to review the sub-family *Circinae*, the Harriers. We have a specimen from the old College Museum of *Circus Cyaneus*, the hen harrier, seemingly the same as the British species, and we have a female of the same which I believe is a European specimen; but the bird seems very difficult to procure here. It is declared by some high authorities to be only the mature form of our Marsh-hawk. I wish I could know the exact grounds for this assertion in order to judge of the weight to be given to it, but in the mean time I am impressed by the facts that the Marsh-hawk of this country, *Circus uliginosus* of authors, differs considerably from the female as well as the male of the other species, is perhaps our commonest raptorial bird, whilst the supposed mature state is very rare, and the specimens in our collection were supposed to be a pair, and exhibit differences that would seem to imply difference of sex. I must therefore wait better proof before I unite the species, especially considering that the European *Circus rufus*, which is acknowledged to be distinct, bears a great resemblance in colour to our *uliginosus*: yet observations have been reported to me which favour the idea of the identity of the species. *Circus uliginosus* is a very beautiful bird. It plainly displays the same generic characters as *C. Cyaneus*, but there are signs of specific distinctness suggestive of doubt, so that we want clear evidence of the change it undergoes before admitting it as an established fact.

It appears that we have not less than fifteen native FALCONIDÆ— one or two more being probably to be found, and several of them requiring careful investigation of their history by those whose country residence, out-of-door pursuits, and fondness for the use of the gun afford them the required opportunities. The British members of the family reach twenty in number, but some of them are very rare visitants, and, as we may possibly add one or two, and mine is a strictly local list, the difference is not material.

The family we have been examining is specially employed by Providence to keep within proper bounds the increase of the smaller birds, mammals, reptiles, and even the larger insects. Their armature of foot and beak, the power of their wings, and their mode of seizing

their prey, are nicely adapted in each case to the habits of their intended victims. It is observable that from the small number of their eggs and their slow growth and peculiarly helpless infancy, they increase much less rapidly than the animals on which they feed, and where the dominion of man renders their functions less necessary, their numbers soon diminish. Thus the balance among differing forms of life and the harmony of nature are preserved, and all beings, in seeking the supply of their own wants and the enjoyments which awaken their desires, fulfil the purpose of the great author of being, act under his control, and show themselves his servants. Inferior creatures, guided only by instinct and by the common wants of the animal nature, perform their part, kept within bounds by the natural enemies raised up for them. Man, the chief of the creation, is permitted to rule over others, and called upon to rule himself; he alone has the privilege of a moral nature. He is capable of distinguishing good and evil, submitting himself to restraint under the influence of motives, knowing the existence and learning the will of the Great Invisible, and by faith anticipating his gracious promises. He uses reason in avoiding the injuries with which the operation of natural laws threatens him, and in deriving the highest advantages from powers which seem most formidable and destructive. To the thoughtful mind every object in nature speaks of beauty, order, and wise design for the production of good. The fiercest creatures have a needful and beneficent mission; apparent evil has its limits and its good results. As we rise through nature to the God of nature, we should learn from what we see humility, resignation and trust, and should most gratefully accept the spiritual privileges which are our highest distinction, constituting our true elevation above the beasts of the field and the fowls of the air, whose structure and instincts most interest us as expressions of that supreme wisdom and benevolence in which all our hopes are placed.

NOTE ON THE MORE CHARACTERISTIC FOSSILS OF THE HUDSON RIVER GROUP OF TORONTO AND ITS ENVIRONS.

BY J. F. SMITH, JR.

Read before the Canadian Institute, April 2nd, 1859.

The object of this communication is, principally, to point out to the student of Canadian Palæontology, residing in the neighbourhood of Toronto, the characteristic fossils of the Hudson River Group, as there developed, and the localities from which these fossils may be obtained. The most important localities comprise the valley of the Humber, and more especially the neighbourhood of Weston, on the west; and the Don Mills on the east. Weston is particularly prolific.

The rocks of the Hudson River Group, lying above the Utica slate and below the Medina sandstone, comprise chiefly a series of greenish and brown arenaceous shales, with some interstratified beds of limestone. This formation extends along the shore of Lake Ontario from the Township of Pickering to the Township of Nelson, although it is much covered up and concealed by the overlying drift-clay and sands.

A list of fossils obtained from an excavation on the esplanade, now closed up, has already appeared in the Journal (Vol. I. New Series.) Since the publication of Professor Chapman's note, however, I have thoroughly explored the surrounding country, and I have been rewarded by the discovery of many additional species. Thinking that a list of these, as the result of actual personal observation may not be altogether devoid of practical interest, I have ventured to draw up the following classified distribution :

Commencing with the sub-kingdom, ARTICULATA, we have the great extinct family of the *Trilobites.* The two species found in the Hudson River Group are : *Calymene senaria* (Conrad), and *Asaphus platycephalus* (Stokes). The first named, *Calymene senaria,* or *Blumenbachii,* is very abundant everywhere, and is probably the most common trilobite known. It is found at Weston in the shale which occurs there. Specimens with the head attached, however, are rarely met with at that locality. It is also found at the Don Mills. *Asa-*

phus platycephalus is principally found up the Humber and at Weston. It occurs, commonly, in a fragmentary state.*

We next take the MOLLUSCA. Beginning with the *Cephalopoda,* we have the family of the *Orthoceratidæ.* The *Orthoceras* was a long straight shell, as its name indicates, with a tube running from end to end called the siphuncle. The shell is divided transversely into chambers by simple septa. Of this genus we have *Orthoceras coralliferum* (Hall), and *Orthoceras lamellosum* (Hall). The so-called genera *Endoceras* and *Ormoceras* are also found at Milton up the Humber. The siphuncle of *Endoceras* is said to be made up of funnel-shaped diaphragms, and is very large. The same organ in *Ormoceras* is beaded. These distinctions as generic characters do not now hold good; and Endoceras and Ormoceras, with some other genera are included in the genus *Orthoceras.*

The GASTEROPODA next claim our attention. *Cyrtolites ornatus* (Conrad), a very beautiful shell, is excessively common at Weston, and indeed at all the localities mentioned above. *Murchisonia gracilis* (Hall) the most common of the *Murchisonias,* (a genus named after Sir Roderick Murchison), is found in a good state of preservation at Weston. *Pleurotomaria subconica* (Hall) is rather rare. It is found at Weston, and also at Toronto. A beautiful specimen of *P. bilix* (Conrad), retaining the shell and epidermis or colouring, was found in Toronto.† *Bellerophon cancellatus* (Hall) is very rare, only two or three specimens having been met with in this neighbourhood.

No PTEROPODS have yet been discovered here.

The BRACHIOPODA come next in order, and are extensively represented. The most characteristic are: *Leptæna sericea* (Sowerby), and *L. alternata* (Conrad), both very common at Weston and other places. *Atrypa increbescens* (Hall), is comparatively rare. *Lingula quadrata* (Eichwald), has been discovered at Weston badly preserved. The shell has the dark, polished aspect, so characteristic of the *Palæozoic lingulæ.* *Orthis testudinaria* (Dalman), a fossil distributed widely throughout the Lower Silurian system. *Orthis erratica* (Hall) is also

---

* To these Trilobites we may add *Trinucleus concentricus,* discovered quite recently in the neighbourhood of Toronto by one of our Students, Mr. William Brown, of Cobourg. C. W.—[E. J. C.

† By the late much lamented Mr. John Head, the only son of his Excellency Sir E. W. Head, Bart., whose early loss, at the commencement of a career so rich in scientific promise, cannot be too deeply deplored. The Editors of the *Canadian Journal* join most sincerely in this expression of regret.

exceedingly common and very well preserved in our neighbourhood. *Orthis occidentalis* (Hall) is abundant here and at the Humber River. *Orthis* (formerly *Spirifer*) *lynx* (*Eichwald*). I have obtained one or two specimens of this fossil from Humber Bay.

Among the CONCHIFERA we have in the *Aviculidæ*: *Avicula demissa* (Conrad), an abundant fossil; and *Ambonychia radiata* (Hall), is also excessively common. In the *Mytilidæ* we have the well known *Modiolopsis modiolaris* (Conrad), a very plain looking shell notwithstanding its long name. *Modiolopsis curta* (Conrad), is rather rare. Besides these two species, *M. anodontoides*, and *M. faba*, with *Orthonota parallela* (Hall), have also been obtained from the shale at Weston.

Nucula postriata (Conrad), is an example from the family of the *Arcadæ*.

In the *Trigonidæ Lyrodesma plana* (Conrad), with its peculiar radiating teeth has been discovered. I have also obtained *Cleidophorus planulatus* (Conrad), (family of the *Cyprinidæ*) from the fine green shales of Weston, and Prof. Chapman has the same species from Toronto; but it does not appear to be common.

Chætetes lycoperdon (Say), is the most common and at the same time the only coral yet discovered here. It occurs both in the "puff-ball" and branched forms at all the localities.

We have as yet no *Cystideæ*, and only the stems of *Crinoideæ*, principally *Glyptocrinus decadactylus* (Hall).

Among the mysterious Graptolites we have *G. pristis* (Hisinger). I have lately obtained several very good specimens. *G. Bicornis* also occurs in the Humber Valley, but the forked ends are generally broken off.

The fossils mentioned in the above list comprise merely the characteristic forms of the Hudson River Group, as obtained in my own explorations around Toronto. A few other forms occur, but not in sufficient abundance to be considered characteristic; and I have therefore abstained from alluding to them. I trust, however, that this brief notice may induce some of the younger members of the Canadian Institute to turn their attention to this interesting study, and that our list of fossil species may in this manner be eventually much increased. I think it but right to add, that my own attention was directed in the first instance to this pursuit, by a paper on Trilobites which appeared in a recent volume of our Journal.

ON THE EMPLOYMENT OF THE ELECTRIC TELEGRAPH IN DETERMINING THE LONGITUDE OF SOME OF THE PRINCIPAL PLACES IN CANADA.

BY LIEUT. E. D. ASHE, R.N., F.R.A.S.

The introduction of the telegraph wire into an Observatory, and the facility and rapidity of registering observations by its means, may be considered one of the most useful adaptations of the age; and I never recollect having been more deeply impressed by the idea of man's intellectual development, than I was when I heard the "relay" in the Observatory, Quebec, beating the seconds of the Sidereal clock in the Observatory at Cambridge. I have long ceased to wonder at the snorting locomotive as it dashes past at the rate of forty miles an hour, dragging some hundreds of human beings in its wake. Man can reason step by step, from the tea kettle until he arrives at the steam engine, but when we hear the pulsations of a clock, be it ever so far off, our reasoning faculties stagger under the stupendous fact. It follows then, as a matter of course, that as the beating of a clock in one observatory can be heard in another, no method can be so accurate for determining the difference of meridians as the mode of doing so by the electric telegraph.

Two fixed observatories being connected by the telegraph wire, there are various modes of determining their difference of meridians. Perhaps the most accurate is to send a signal every time a star of a pre-arranged list passes each wire of their respective transit instrument, and as the time of these signals is carefully noted in each, it follows that the time taken by each star to pass from the meridian of one observatory to that of the other can be most accurately obtained. Care, however, must be taken to change the observers in order to eliminate the personal equation. And if the signal be sent from east to west, and again from west to east, the time occupied by the signal in passing along the line causes the meridional difference to be too great in one instance and too little in the other, and consequently the mean gives a correct result. For instance, let the observatory A be twenty minutes to the eastward of an observatory B, and suppose the signal to occupy one second in going along the line, then if A sends a

signal at 4h. 30m. 10s., if no time is lost, B will receive the signal at 4h. 50m. 10s.; but as we suppose the signal to occupy one second in passing from A to B, B will receive the signal at 4h. 50m. 11s., and the difference of meridians will be 20m. 10s., a second too much. But supposing B to send a signal to A at 4h. 50m. 10s., then A will receive it at 4h. 50m. 11s., and the difference of time will be 19m. 59s., evidently one second too little, but the mean of the results give 20m., the correct difference of longitude. Therefore by the observers exchanging places, and by sending the signal backward and forward, the greatest accuracy may be obtained.

Lunar and Stellar photography may be the means of superseding the laborious and imperfect manner of taking observations with the human eye; and it is to be hoped that the noble example set by the Observatory, Cambridge, U. S., in this respect, may be followed by others, and that we shall ultimately succeed in making the heavenly bodies register their own observations. With respect to Stellar photography, so much will depend upon the state and purity of the atmosphere, that but few places are well adapted to this mode of observing, but many say that Quebec has the advantage in this respect over most other places in British America, and I sincerely hope that ere long Stellar photography will be taken up by Canada.

Before giving my report on the determination of longitude, I will make a few observations, that may be useful to those who may be occupied on a future occasion in determining meridional distances.

On arriving at the place, just call at the telegraph office and make friends with the department, as without their hearty co-operation it is useless to proceed. Then look out for some rocky ground near to the office, where you can build your observatory. Let the support of your instrument be of stone, and of a height that will enable you to apply and read the level when standing on the ground. This is of great importance, as the level must be applied quickly and often. Also take care to have the screw that moves the instrument in azimuth to your right hand, in looking to the northward. If you are left-handed, *vice-versa.* See that the Collimation has not been thrown much out by travelling. If it has, correct it as nearly as you can by the middle wire in reversed positions.

As you do not know the longitude of the place within two minutes, and as the rate of your chronometer should not be trusted with its former rate, after travelling, you can not get the instrument into the

meridian by bisecting a star with the middle wire—as the correct time can not be known by the chronometer, and procuring observations for the correct local time would occupy much time—I recommend the following way to get a transit instrument quickly into the meridian.

First direct the instrument to a point about a degree and a half from Polaris, in a line joining that star and the fifth star of the Great Bear. This ought to place the transit instrument within half a degree of the meridian; then take from the nautical almanac two circumpolar stars, that differ about twelve hours in their R. A. For instance, 51 *Cephei* and δ *Ursæ minoris* on March 1st, 1859, had a difference of R. A. of 15m. 58·75s.—51 *Cephei* passing *sub. polo.* first, and it will come into the field of an inverting telescope on the right; before it has passed the second wire of the instrument (if it is not much out of the meridian) by elevating the telescope, δ *Ursæ minoris* ought to be in the field. If it is not, move the north end of the telescope to the east until it is. When you have got these stars within range of the field, and (as near as you can guess) 51 *Cephei* 15m. in advance, there will then be sufficient time to adjust the level, which has of course been put out by moving the instrument. Should you have a mean solar chronometer, the difference of R.A. 15m. 58·75s. must be turned into mean time. Now mark the time that 51 *Cephei* passes the middle wire, and if the transit is in the meridian, δ *Ursæ minoris* will come to the middle wire in an opposite direction 15m. 58·75s. after 51 *Cephei*. Should it not do so, mark its position at the moment that it *should* be at the middle wire, and then by turning the azimuthal screw, bring δ *Urs. min.* not quite half way towards the middle wire. The distance that the star is to be moved is known by looking at deviation factors. This mode of proceeding is independent of the error of the chronometer; it only supposes that it goes with an even rate for a quarter of an hour, and by one operation it should place the instrument within one second of time of the meridian. You then take observations for the errors of deviations, and proceed at once to get local time.

By looking at my report to Sir William Logan many causes of failure may in future be avoided, and perhaps some trouble saved:—

REPORT TO SIR W. E. LOGAN, F. R. S.

QUEBEC, 20th January, 1858.

SIR,—In the month of October, 1856, at your request I left Quebec for Montreal, in order to determine by electric telegraph the longitude

of that city. On my arrival, the first object was to procure a suitable place, not far from the telegraph wire, and permission was given to make use of the top of the Exchange.

The transit instrument was placed upon a stack of chimneys, and a temporary canvas cover erected to protect the instrument from the wind. On the 28th October the transit instrument was in the meridian, the telegraph wire was led up to the top of the house, and a message sent to Quebec to be ready at 7 P.M. The night was fine and clear, and we commenced by giving a signal to look out when a star entered the field of the telescope, and as it passed each wire a single dot was sent along the line to Quebec. The assistant, Mr. Heatley, on the signal being given to look out, listened attentively to these dots and to the tick of the sidereal clock, and registered the fraction of a second: by these means the observations at Montreal were noted down with all the ease and facility that could have been attained in a properly fitted observatory, instead of the temporary arrangement we had on the top of a house.

From the operators not understanding some technical expressions, and from the novelty of the transaction, many stars were lost; but considering that it was a first trial we had every reason to expect that we should finally succeed.

On the following night we were again connected by the telegraph wire, but after sending a few stars a great disagreement was found to exist between this and the preceding night's work. On my taking observations to determine the errors of the instrument, I found that it had moved considerably out of the meridian; and subsequently I discovered that the passing of a cart, even at the distance of two streets, put the whole chimney in motion; for this there was no remedy, and the idea of succeeding with the present arrangement was hopeless.

Having to return to Quebec, I left on the 2nd November, with the knowledge gained by experience that a transit instrument placed on the top of a house could only give doubtful observations, which were worse than useless.

On the 29th December I left Quebec for Toronto, and on my arrival took up my quarters with my friend Professor Kingston of the Magnetic Observatory. Here there was every convenience, a small transit instrument in position, and a sidereal clock. The observations for time were under the superintendence of Professor Kingston. The distance of the Observatory from the Telegraph Office is, I should think, about

two miles, and the work of leading the wire through the town and into the Observatory presented many difficulties—one, the ground being frozen hard could not be opened for sinking the posts, and another, the interference with private property; but by the hearty co-operation of the Superintendent of the Telegraph Office, Mr. Dwight, and by some contrivance, these difficulties were surmounted.

The cloudy state of the atmosphere prevented our working until the 17th January, which was fair for observations. As our object was to determine the time by the face of our respective clocks at the same instant, thirty dots were sent at intervals of a second in each minute, so that if the clocks were not beating together, the fraction of a second that one clock was after the other might be guessed at. The fraction being known, the second, minute, and hour are sent, and consequently the readings of the two clocks are known at the same moment.

The errors of the clocks were obtained by observations of many stars on the same night, and the errors applied to the respective clocks; the true difference of time between Quebec and Toronto was thus known, and hence the longitude. *See Table.*

On the 5th February I left Quebec for Kingston, and on my arrival was offered a home and every assistance by Dr. Yates. The site which I selected for the temporary Observatory is situated in a cross street between Earl street and Barrie street. Two large blocks of limestone were brought and placed in the corner of a yard, and some planks about six feet long were fixed around them, covering in a space about eight feet square. This was also some distance from the Telegraph Office, but by taking advantage of an old fence and of an occasional tree, the wire was brought to the Observatory without much difficulty.

My past experience had taught me to avoid the tops of houses, and to select the solid earth and solid rock for the support of my transit instrument. Still I had another lesson to learn. This neighborhood was infested with boys, who when they saw a light shining through the cracks of the boards, commenced throwing stones with a determination and precision worthy of a better cause; and some of the few clear nights that occurred in this month were lost in consequence of boys' love of mischief. I first tried mild entreaties and then severe threatenings; they laughed at the former, and made faces at the latter. I then procured the service of the police, who partly succeeded in keeping the boys from further interference with my duties.

On the night of the 20th February, all being ready, and the weather

favorable, we made arrangements for sending signals to Quebec. I found that the method adopted at Montreal, of sending a signal to the Observatory at Quebec each time a star passed the wire of the telescope, involved the necessity of employing a telegraph operator for some hours; but by merely exchanging the time, the operator was not required for a longer period than half-an-hour; consequently, in this case, we sent thirteen taps, at intervals of twenty seconds, from Kingston to Quebec, from a mean solar chronometer. As a sidereal clock gains one second on the mean solar chronometer in six minutes, Quebec listened for and marked down the second of the sidereal clock which was co-incident with the signal sent from Kingston, and consequently without any guess-work, had the fraction of a second. Quebec then sent similar signals from the sidereal clock, and Kingston listened for and marked down the second which was co-incident with the signal sent from Quebec; in this way was the difference between the two places ascertained to the hundreth part of a second. I conceive that signals sent from one end of the line by *mean time* and from the other end by *sidereal time* ensure the most satisfactory results. Although the observations for time were not very satisfactory, still from the severity of the weather, and the nuisance above alluded to, I resolved not to stay any longer for further trials, but left for Montreal on the 30th. On my arrival, I accompanied you, and we reconnoitred in the neighbourhood of Viger Square, where we were glad to find that there appeared to be a scarcity of boys, and those that did heave in sight were perfectly tame. The gardener's tool-house, in Viger Square, appeared well suited to our purpose, and by placing a large block of limestone on a solid basis built beneath it, we had in perfection the principal requisite for the support of a transit instrument—that of fixity.

In order that I might avail myself of every opportunity of taking observations, I took up my residence there, and although great cold was experienced, nevertheless the advantage of being close to my work far more than compensated for the severity of the weather.

The night of the 12th March was clear, the instrument firmly fixed and well adjusted, and signals were sent to and from Quebec. Although the electric current was weak, and the signals at the Montreal end of the line difficult to be heard, still the results were most satisfactory, and I left on the following morning for Quebec.

Chicago being placed on some charts, in a longitude differing by

upwards of forty miles from that on another, it was of the greatest consequence before making a map of Canada, that the right position of Chicago should be ascertained. I therefore with that view, left Quebec early in the month of April, for this renowned city, and on my arrival, called on Lieut.-Col. Graham, U. S. A., and stated the object of my visit. He offered and gave me his valuable assistance, and obliged me by taking charge of the operations at one end of the line; after an observatory was erected, my transit instrument in position, and the telegraph authorities spoken to, I hurried back to Quebec, and found that they had succeeded on one night in sending signals; but in consequence of the weather not being very favorable at Chicago, we were again in communication on the night of the 15th May.

The electric current was transmitted *via* Toledo, Cleveland, Buffalo, Toronto and Montreal, a distance of 1210 miles, by one entire connection between the two extreme stations, and without any intermediate repetition, and yet all the signals were heard distinctly at either end of the line; the signal occupied only ·08 of a second in passing along that distance.

On the 24th July, I left Quebec for Windsor, and my past experience enabled me soon to select a spot suitable for the transit instrument, around which a covering of boards was put up; on the night of the 15th August we succeeded in sending signals to Quebec; but unfortunately the sky became cloudy, and I was unable to get satisfactory observations for the local time. However, on the 18th, the signals and observations for time were most complete.

On the 19th, I left Windsor for Collingwood, and on my arrival, I found rock and quietness in the yard of Mr. Armstrong's house, where I was stopping. The instrument was in position and the night favorable, on the 1st September, and satisfactory signals were exchanged. I left on the following day for Quebec.

It was now most important that the longitude of Quebec should be determined with the utmost possible accuracy. I had formerly by electric signals on one night from Fredericton, N. B., obtained, by the kindness and assistance of Doctors Toldervy and Jack, the position of the Quebec Observatory, but on that night observations for our local time could not be taken, and we had to trust to the observations taken on the previous night and to the good character of the sidereal clock.

If we had been able to get the difference of longitude between

Fredericton and Quebec, the position of the Quebec Observatory would have been quite certain, as the longitude of the former had been obtained by frequent signals on many nights with Cambridge, which by interchange of several hundred chronometers with Greenwich, is supposed to have its meridional difference of longitude ascertained with all the accuracy possible short of that to be arrived at by the transatlantic cable.

We were unable to again get telegraphic communication with Fredericton on account of the submerged cable at Cape Rouge being broken; but Professor W. C. Bond, of Cambridge Observatory, offered in the kindest manner possible to send and receive signals to and from Quebec; on the 21st September and 9th October, the communications between the Observatories of Cambridge and Quebec, were completely successful, and the longitude of Quebec, as well as those places already referred to, finally settled.

The longitude of the Observatory as obtained by telegraphic signals, and the longitude published on the Admiralty Charts differ by no less than fourteen seconds of time, and the other places whose positions have been determined in a similar manner have a still greater difference.

On the 29th October, I left Quebec for Ottawa, and on my arrival put up at Mr. Doran's boarding house and went in quest of a site for the transit instrument. On Barrack Hill there were several blocks of limestone, around one of which I built a little Observatory and had the telegraph wire brought there. The night of the 14th November was beautifully clear, and the result of our night's work most satisfactory.

June 18th, 1858. I left Quebec for Three Rivers, and on my arrival I accepted the kind invitation of Oliver Wells, Esq., to make his house my home, and immediately went in search of a place suitable for fixing the transit instrument. After some time I selected the Barrack Square (then unoccupied) as the spot most suitable for my purpose, as it was close to the Telegraph Office, and was also fenced in, I felt myself secure from the intrusion of boys—the pest of itinerant astronomers; indeed I had not seen any since my arrival.

As there was no rock in the neighbourhood, nor any thing suitable for the support of the instrument, on the sandy foundation that exists in the vicinity of Three Rivers, and as a very fine Roman Catholic Cathedral was in the process of erection not far off, I went at once

to the Curé and begged a stone, when with that politeness peculiar to the French Canadians he placed every thing that he had at my disposal; availing myself therefore of his kind liberality, I took two, and had them carted to the Barrack Square. Previously to my going in quest of a stone I had spoken to a carpenter, who on my return had the stuff cut out ready to board in the transit instrument. The stones were firmly placed, and the telegraph wire by the support of only two posts was brought to the Observatory, and all was ready to take advantage of the fine weather to make preliminary observations, requisite for getting the instrument into the meridian. I then made up my mind to return home and rest until sunset, when I would again return for my night work. On leaving the Barrack Square, to my great dismay I saw that two palings of the fence were pulled down, leaving a space sufficiently large for a boy to get through. I looked upon it in the same manner that a person in taking a house would look at a rat hole in a cupboard, but as all was quiet and not a leaf stirring, my fears quickly subsided. A little before sunset I left my friend's house for the Observatory; it was a lovely evening; the twittering of swallows took me back to other climes and other days; and as it was rather early I sauntered along with my thoughts wholly absorbed in this world and not in others, when a sound came floating on the air that quickly dispelled my reveries. It was the noise of boys at play. I then was sensibly made aware of the fact that there were boys in and about Three Rivers—Yes,—and when I came in sight of the Barrack Square I saw it full of boys playing cricket—my feelings might possibly be imagined but they could not be described. I came amongst them just at that part of the game, when they had cried "over." Some boys were taking up their positions by jumping like a frog over the backs of all who came in their way, others by rolling like a carriage wheel into the place assigned to them. Kingston and all its annoyances came now to my mind, but I observed that they were a different sort of boy from that of Kingston. The type of the latter may be considered as short, deep chested, yellow hair, blue eyes, one of which was always winking at a companion, face much freckled, voice loud and shrill, accompanied by a habit of putting the thumb to the nose when spoken to. The type of the former may be considered as tall, dark hair, hazel eye, musical voice, with a habit of paying attention when spoken to. I went up to them and explained the delicate nature of the instruments that

were near them, begged that they would not discontinue their manly sport, as I was sure that they would be careful not to do any harm; they promised to do so, and after they had finished the game they went off and never more gave the least annoyance. That night I got the instrument nicely adjusted, and after only one failure succeeded in sending and receiving signals to and from Quebec on July 1st, that gave a most satisfactory result. I left on the 5th for Quebec.

In conclusion I may say that the ease and accuracy with which the position of a place can now be fixed by means of the electric telegraph renders it imperative that all those places which can avail themselves of the use of the telegraph line, should have their longitudes determined at once, in order that a correct map of Canada may be produced.

Subjoined I send you an abstract of the observations made.

I have the honor to be, Sir,
Your most obedient servant,
E. D. ASHE.

Abstract of the Telegraphic Observations determining the Longitudes of several places in North America, by LIEUT. E. D. ASHE, R.N.

QUEBEC, 21st September, 1857.

The place of observation was the Observatory in Mann's Bastion, Citadel.

	H.	*m.*	*s.*
By the signals sent from Quebec to Cambridge, the difference of longitude is shown to be..................	0	0	18.27
And by the signals from Cambridge to Quebec..................	0	0	18.25
Mean difference of longitude by the work of the 21st September...	0	0	18.26
Again on the 9th October:—			
By the signals sent from Quebec to Cambridge, &c...............	0	0	18.44
By the signals from Cambridge te Quebec......................	0	0	18.33
Mean difference of longitude by the work of the 9th October......	0	0	18.38
Mean of both nights' work:—			
Quebec Observatory west of Cambridge Observatory.............	0	0	18.32
Longitude of Cambridge west of Greenwich, as communicated by Professor W. C. Bond..................................	4	44	30.70
Longitude of Quebec Observatory..........................	4	44	49.02

TORONTO, 21st January, 1857.

The place of observation was the Magnetic Observatory.

	H.	m.	s.
By the signals sent from Quebec, Toronto is west of Quebec......	0	32	44.51
By the signals from Toronto, " " "	0	32	44.31
Mean difference of longitude..................................	0	32	44.41
Longitude of Quebec..................................	4	44	49.02
Longitude of Toronto Magnetic Observatory	5	17	33.43

KINGSTON, 28th February, 1857.

The place of observation was the new Court-house.

	H.	m.	s.
By the signals sent from Quebec, Kingston is west of Quebec	0	21	05.60
By the signals from Kingston, " " "	0	21	05.39
Mean difference of longitude..................................	0	21	05.50
Longitude of Quebec	4	44	49.02
Longitude of Kingston	5	5	54.52

MONTREAL, 12th March, 1857.

The place of observation was in Viger Square, 650 feet west of Capt. Bayfield's station on Gate Island.

	H.	m.	s.
By the signals sent from Quebec, Montreal is west of Quebec......	0	9	23.01
By the signals sent from Montreal, " " "	0	9	22.38
Mean difference of longitude	0	9	22.70
Longitude of Quebec	4	44	49.02
Longitude of Montreal..................................	4	54	11.72

CHICAGO, 15th May, 1857.

The place of observation was in the play-ground of the School situated to the northward of the Roman Catholic Church, Huron Street.

	H.	m.	s.
By the signals sent from Quebec, Chicago is west of Quebec	1	5	41.44
By the signals sent from Chicago, " " "	1	5	41.60
Mean difference of longitude..................................	1	5	41.52
Longitude of Quebec	4	44	49.02
Longitude of Chicago..................................	5	50	30.54

WINDSOR, 18th August, 1857.

The place of observation was in the yard of Mr. Sholand in Goyeau Street, about fifty yards to the westward of the new English Church, and twenty yards to the westward of the Court-house.

	H.	m.	s.
By the signals sent from Quebec, Windsor is west of Quebec......	0	47	19.04
By the signals sent from Windsor, " " "	0	47	18.97
Mean difference of longitude.....................	0	47	19.00
Longitude of Quebec	4	44	49.02
Longitude of Windsor	5	32	08.02

COLLINGWOOD, 1st September, 1857.

The place of observation was the Railway terminus.

	H.	m.	s.
By the signals sent from Quebec, Collingwood is west of Quebec...	0	36	01.43
By the signals sent from Collingwood " " " ...	0	36	01.59
Mean difference of longitude	0	36	01.51
Longitude of Quebec	4	44	49.02
Longitude of Collingwood..	5	20	50.53

OTTAWA, 14th November, 1857.

The place of observation was 120 yards east of the Flag-staff on Barrack Hill.

	H.	m.	s.
By the signals sent from Quebec, Ottawa is west of Quebec	0	17	59.24
By the signals sent from Ottawa, " " "	0	17	59.30
Mean difference of longitude....................................	0	17	59.27
Longitude of Quebec	4	44	49.02
Longitude of Ottawa	5	2	48.29

THREE RIVERS, 1st July, 1858.

Place of observation at Three Rivers was in the Barrack Square, due south of old French Church.

	H.	m.	s.
By signals sent from Quebec, Three Rivers is west of Quebec......	0	5	20.14
By signals sent from Three Rivers " " "	0	5	20.18
Mean difference of Longitude	0	5	20.16
Longitude of Quebec	4	44	49.02
Longitude of Three Rivers.....................................	4	50	09.18

NOTE.—It may be interesting to compare the longitudes as determined by Lieut. Ashe, with the values previously assigned to them :

	H.	*m.*	*s.*
Quebec, former value	4	45	04
" Ashe	4	44	49.02
Toronto Observatory, by M. C. Stars in 1840	5	17	19
" by Chronometer with Boston	5	17	33
" Mean of above, formerly adopted	5	17	26
" Ashe	5	17	33.43
Kingston, usual value	5	06	40
" Professor Williamson, 1854	5	06	08.48
" Ashe	5	05	54.52
Chicago, usual value	5	50	20
" Ashe	5	50	30.54

REVIEWS.

Geological Survey of Canada. Figures and Descriptions of Canadian Organic Remains: Decades I and IV. Montreal, 1859.

A notice of the third Part or Decade of this important publication appeared in the *Canadian Journal* of last January.* It was there explained how the work had been allotted by the Director of the Survey, Sir W. E. Logan, to different palæontologists. In consequence of this arrangement, each part becomes more or less independent of the other portions of the series, and thus no consecutive order has been followed in their publication. Decade III, containing Mr. Billings' elaborate essay on our Canadian cystideans, with other valuable papers, having been completed first, was first published. Decades I and IV were issued a few months later, and it is to these that we have now to direct the reader's attention. The first, by Mr. Salter, one of the ablest of European palæontologists, comprises a series of figures and descriptions of various gasteropods and other forms, chiefly from the beds at Pauquette's Rapids on the Ottawa, in which a commingling of Chazy and Black River fossils, with those of the higher portion of the Trenton Group, was first pointed out by

* *Ante,* page 42.

Sir William Logan. The widely known *Maclurea Logani* is one of the most remarkable of these forms. It has been regarded popularly as a left-handed or sinistral Euomphalus, but its affinities are quite distinct from that type. Mr. Salter agrees with Woodward in regarding it as a Heteropod, or Nucleobranchiate Gasteropod, of the Family of the Atlantidæ, and thus allied to Bellerophon and Cyrtolites; and also in looking upon the shell as *dextral* the flattened surface with the whorl-markings being consequently the *under* part, in the proper position of the shell, while the so-called umbilicus, on the other hand constitutes a perforated spire. This apparently abnormal position is sustained by an examination of the large and curious operculum, the nucleus of which would otherwise be situated in the *upper* inner-angle of the aperture, a position hitherto unrecognized in operculated shells.

A good deal of confusion prevails in the writings of our New World palæontologists with regard to many of the turbinated and discoidal types of the palæozoic rocks. Mr. Salter has attempted to clear this up with respect to some of the Lower Silurian forms. He places, as sub-genera, under Conrad's genus *Scalites*, Hall's *Raphistoma*, a new sub-genus of his own, called *Helicotoma*, and Vanuxem's *Ophileta*; making also a sub-genus of *Scalites* proper. All these he regards, and truly, as belonging to the Family of *Janthinidæ*; whilst *Murchisonia* and *Pleurotomaria*, if not belonging to the same Family, stand in the adjacent group of the *Trochidæ*; and Hall's *Cyclonema* and *Holopea*, with his own *Trochonema* and *Eunema* fall into the related group or Family of the *Litorinidæ*. It is, however, far from improbable, that at some future time the limits of the *Janthinidæ* will be extended so as to include the whole of these types.

Amongst the fossil forms of our older palæozoic rocks, few have occasioned more perplexity than the *Receptaculites* of Defrance. Although commonly placed amongst the corals, the true affinities of this remarkable type have hitherto baffled observation. Mr. Salter, in the work before us, enters into a somewhat extended discussion and analysis of its structural peculiarities, and refers it to the *Orbitolitidæ Family* of the FORAMINIFERA.* If further investigations sustain this view, we have in the *Receptaculites* the earliest recognised foraminifera,

* Mr. Salter states that this view had suggested itself, some years ago, to Mr. T. R. Jones of the Geological Society of London, but had never been followed up.

giants amongst their tribe as compared with later and existing forms. Mere size, however, should be no obstacle to the reception of Mr. Salter's ingenious suggestion, since there is in that respect less difference between Receptaculites and the larger *Nummulites*, than between the latter and the ordinary foraminiferous forms. A new species, *R. occidentalis*, abundant at Pauquette's Rapids, is described and beautifully illustrated at the close of Mr. Salter's memoir.

The Fourth Decade of "Canadian Organic Remains" comprises a complete and very interesting description of the Crinoids of our Lower Silurian rocks, from the Chazy to the Hudson River formations inclusive, by Mr. Billings, Palæontologist to the Survey. The species described, of which the greater part are new, amount to about fifty. The detailed description of these is very properly preceded by a brief essay on the history and structure of Crinoideæ generally, a plan not only convenient in itself, as explanatory of special terms, and in adding completeness to the work, but also of the greatest assistance to the student; more especially in a country like this, where books of reference are not always procurable, and in which so few public libraries exist. The length of this introductory essay, and the want of its explanatory woodcuts, prevent us from transferring to the pages of the *Canadian Journal;* but the work will necessarily be in the hands of all who take an interest in the subject.* It is now very generally known, that although the greater number of the ancient crinoids, as in the modern *Pentacrinus*, were attached to the sea-bottom by a jointed calcareous stalk, a few species were free or without a stalk; and that the existing *comatulæ* are attached in the embryonic or early condition, and free in the adult state, All our Silurian crinoids (properly so-called) possess however a many-jointed stem; but Mr. Billings conceives, that some of these were also at times free, and that they "moved about through the water dragging their columns after them." He cites more especially the *Glyptocrinus ramulosus*, in which species the column often tapers gradually from about half-an-inch at the base of the cup, to half-a-line at the lower extremity or supposed point of attachment; and in which, furthermore, when perfect, this lower end is always found to be closely curled up "like a miniature coil of rope." Another

* It cannot be too often repeated that these Decades, unlike the earlier publications of the Survey, are obtainable through any bookseller.

species, cited in this connexion, is the *Rhodocrinus pyriformis*. With regard to this species, Mr. Billings states that he has "seen specimens with from six to ten inches of the column attached to the base of the cup, and with the terminal joint, where the fracture occurred, rounded, and the alimentary canal closed, or, as it were, healed up:" a condition which certainly goes far in favor of his suggestion.

A new and interesting genus belonging to the order *Blastoidea*, has been founded by Mr. Billings, upon various fragmentary specimens discovered in the Chazy Limestone of the neighbourhood of Montreal. He has named it *Blastoidocrinus*. A single species, *B. carchariædens*, has been determined. It is evidently related to the genus *Pentremites*, and is chiefly interesting from its low position in the rock series as a Blastoid, and as offering certain connecting characters between *Pentremites* and the ordinary crinoids. Mr. Billings believes that the column actually passes through the cup to the upper part of the visceral cavity, the basal plates being so conformed as to admit of this peculiar, and, indeed, abnormal structure. Two examples have been found with the cup thus penetrated by the column, but some additional evidence seems necessary, viewing the fractured and imperfect state of the specimens, to render this remarkable conformation altogether free from doubt. Various new genera and species of true crinoideæ have also been established by Mr. Billings, and are described in this Decade with great care and amplitude of illustration; but in the absence of the explanatory engravings it would be useless to lay their characters before the reader. On these engravings too much praise cannot be bestowed. The illustrations of Decade III, moreover, have been executed entirely on Canadian soil.

E. J. C.

The Romantic Scottish Ballads; their epoch and authorship. By Robert Chambers, F.R.S.E. Edinburgh: W. & R. Chambers, 1859.

In a recent review of Professor Aytoun's collected edition of the ballads of Scotland, we drew attention to the interesting fact, that many of the best songs and ballads of Scotland now traceable to their authors, prove to be the work of Scotland's daughters; and these including not only pieces of such delicate and tender pathos as "Auld Robin Gray," and "The Land of the Leal," but piquant satires and

humorous political pasquinades, like Lady Nairn's "Laird of Cockpen," and Mrs. Cockburn's clever Jacobite burlesque of Prince Charlie's manifesto, to the tune of "Clout the Cauldron." Since then, however, Mr. Robert Chambers, long since distinguished among the editors and collectors of Scottish songs and ballads, has commenced the publication of a series of "Edinburgh Papers," the first of which, under the title at the head of this article, startles us with the novel theory that the romantic Scottish ballads—instead of belonging to the ancient era hitherto ascribed to them,—are forgeries of a comparatively recent date, and that the authorship of the choicest and most popular of them is another of our fair Scottish songsters of the eighteenth century: Lady Wardlaw, of Pitreavie, who died in 1727. The theory is at once so startling, and so comprehensive in its bearings on the whole question of the transmission of early popular poetry by means of oral tradition, that we must place our critical iconoclast's arguments and illustrations at some length before the reader. If his line of argument is admitted, Mr. Chambers claims for this hitherto unheeded poetess, not only "*Hardyknute,*"—the modernness of which both in form and thought no one will dispute,—but what Coleridge has designated the grand old ballad of *Sir Patrick Spence;* and the authorship of these being conceded, he next proceeds to assign to the same gifted lady's pen, the favourite version of "*Gil Morrice,*" in Percy's "Reliques," and then, in all probability, "*Edward, Edward,*" "*Gilderoy,*" "*Youny Waters,*" and in short, all the tender and romantic Scottish ballads of Percy's Collection, and nearly all others marked by a corresponding refinement and tenderness.

I shall lead the reader—says Mr. Chambers,—through the steps by which I arrived at my present views upon the subject.

In 1719, there appeared, in a folio sheet, at Edinburgh, a heroic poem styled *Hardyknute,* written in affectedly old spelling, as if it had been a contemporary description of events connected with the invasion of Scotland by Haco, king of Norway, in 1263. A corrected copy was soon after presented in the *Evergreen* of Allan Ramsay, a collection professedly of poems written before 1600, but into which we know the editor admitted a piece written by himself. *Hardyknute* was afterwards reprinted in Percy's *Reliques,* still as an ancient composition; yet it was soon after declared to be the production of a Lady Wardlaw of Pitreavie, who died so lately as 1727. Although, to modern taste, a stiff and poor composition, there is a nationality of feeling about it, and a touch of chivalric spirit, that has maintained for it a certain degree of popularity. Sir Walter Scott tells us it was the first poem he ever learned by heart, and he believed it would be the last he should forget.

It is necessary to present a few brief extracts from this poem. In the opening, the Scottish king, Alexander III, is represented as receiving notice of the Norwegian invasion:

The king of Norse, in summer pride,
  Puffed up with power and micht,
Landed in fair Scotland, the isle,
  With mony a hardy knicht.
The tidings to our gude Scots king
  Came as he sat at dine,
With noble chiefs in brave array,
  Drinking the blude-red wine.

'To horse, to horse, my royal liege;
  Your faes stand on the strand;
Full twenty thousand glittering spears
  The king of Norse commands.'
'Bring me my steed, page, dapple-gray,'
  Our good king rose and cried;
'A trustier beast in a' the land
  A Scots king never tried.'

Hardyknute, summoned to the king's assistance, leaves his wife and daughter, 'Fairly fair,' under the care of his youngest son. As to the former lady—

......first she wet her comely cheeks,
  And then her bodice green,
Her silken cords of twirtle twist,
  Well plet with silver sheen;
And apron, set with mony a dice
  Of needle-wark sae rare,
Wove by nae hand, as ye may guess,
  But that of Fairly fair.

In his journey, Hardyknute falls in with a wounded and deserted knight, to whom he makes an offer of assistance:

With smileless look and visage wan,
  The wounded knight replied:
'Kind chieftain, your intent pursue,
  For here I maun abide.

'To me nae after day nor nicht
  Can e'er be sweet or fair;
But soon beneath some drapping tree,
  Cauld death shall end my care.'

A field of battle is thus described:

In thraws of death, with wallowit cheek,
  All panting on the plain,

The fainting corps of warriors lay,
Ne'er to arise again;
Ne'er to return to native land,
Nae mair, with blithesome sounds,
To boast the glories of the day,
And shaw their shining wounds.

On Norway's coast, the widowed dame
May wash the rock with tears,
May lang look o'er the shipless seas,
Before her mate appears.

'Cease, Emma, cease to hope in vain;
Thy lord lies in the clay?
The valiant Scots nae rievers thole
To carry life away.'

I must now summon up, for a comparison with these specimens of the modern antique in ballad lore, the famous and admired poem of *Sir Patrick Spence.* It has come to us mainly through two copies—one comparatively short, published in Percy's *Reliques*, as 'from two manuscript copies transmitted from Scotland;' the other, containing more details, in Scott's *Minstrelsy of the Scottish Border*, also 'from two manuscript copies,' but 'collated with several verses recited by the editor's friend, Robert Hamilton, Esq., advocate.' It is nowhere pretended that any *ancient* manuscript of this poem has ever been seen or heard of. It acknowledgedly has come to us from modern manuscripts, as it might be taken down from modern reciters; although Percy prints it in the same *quasi* antique spelling as that in which *Hardyknute* had appeared, where being *quhar;* sea, *se;* come, *cum;* year, *zeir;* &c, It will be necessary here to reprint the whole ballad, as given originally by Percy, introducing, however, within brackets the additional details of Scott's copy:

The king sits in Dunfermline town,
Drinking the blude-red wine:
'O whar will I get a gude sailor,
To sail this ship of mine?'

Up and spak an eldern knight,
Sat at the king's right knee:
'Sir Patrick Spence is the best sailor
That sails upon the sea.'

The king has written a braid letter,
And signed it with his hand,
And sent it to Sir Patrick Spence,
Was walking on the sand.

['To Noroway, to Noroway,
To Noroway o'er the faem;
The king's daughter of Noroway,
'Tis thou maun bring her hame.']

The first line that Sir Patrick read,
A loud lauch lauched he:
The next line that Sir Patrick read,
The tear blinded his ee.

'O wha is this has done this deed,
This ill deed done to me;
To send me out this time o' the year,
To sail upon the sea!

['Be it wind, be it weet, be it hail, be it sleet,
Our ship must sail the faem;
The king's daughter of Noroway,
'Tis we must fetch her hame.'

They hoysed their sails on Monenday morn,
Wi' a' the speed they may;
They hae landed in Noroway,
Upon a Wodensday.

They had na been a week, a week,
In Noroway, but twae,
When that the lords of Noroway
Began aloud to say:

'Ye Scottish men spend a' our king's gowd,
And a' our queenis fee.'
'Ye lie, ye lie, ye liars loud,
Fu' loud I hear ye lie.

'For I hae broucht as much white monie
As gane my men and me,
And I broucht a half-fou o' gude red gowd,
Out ower the sea wi' me.']

'Mak haste, mak haste, my merry men a',
Our gude ship sails the morn.'
'O say na sae, my master dear,
For I fear a deadly storm.

'Late, late yestreen, I saw the new moon
Wi' the auld moon in her arm
And I fear, I fear, my master dear,
That we will come to harm.'

[They had na sailed a league, a league,
A league but barely three,
When the lift grew dark, and the wind blew loud,
And gurly grew the sea.

The ankers brak, and the topmasts lap,
It was sic a deadly storm,
And the waves cam o'er the broken ship,
Till a' her sides were torn.]

O our Scots nobles were richt laith
To weet their cork-heeled shoon;
But lang ere a' the play was played,
Their hats they swam aboon.

[And mony was the feather-bed
That flattered on the faem;
And mony was the gude lord's son
That never mair cam hame.

The ladies wrang their fingers white,
The maidens tore their hair,
A' for the sake of their true loves,
For them they 'll see nae mair.]

O lang, lang may the ladies sit,
Wi' their fans into their hand,
Or ere they see Sir Patrick Spence
Come sailing to the land.

O lang, lang may the ladies stand,
Wi' their gold kames in their hair,
Waiting for their ain dear lords,
For they 'll see them nae mair.

Half ower, half ower to Aberdour,
It's fifty fathom deep;
And there lies gude Sir Patrick Spence
Wi' the Scots lords at his feet.

Percy, at the close of his copy of *Sir Patrick Spence*, tells us that 'an ingenious friend' of his was of opinion that 'the author of *Hardyknute* has borrowed several expressions and sentiments from the foregoing [ballad], and other old Scottish songs in this collection.' It does not seem to have ever occurred to the learned editor, or any friend of his, however 'ingenious,' that perhaps *Sir Patrick Spence* had no superior antiquity over *Hardyknute*, and that the parity he remarked in the expressions was simply owing to the two ballads being the production of one mind. Neither did any such suspicion occur to Scott. He fully accepted *Sir Patrick Spence* as a historical narration, judging it to refer most probably to an otherwise

unrecorded embassy to bring home the Maid of Norway, daughter of King Eric, on the succession to the Scottish crown opening to her in 1286, by the death of her grandfather, King Alexander III, although the names of the ambassadors who did go for that purpose are known to have been different. The want of any ancient manuscript, the absence of the least trait of an ancient style of composition, the palpable modernness of the diction—for example, 'Our ship must sail the faem,' a glaring specimen of the poetical language of the reign of Queen Anne—and, still more palpably, of several of the things alluded to, as cork-heeled shoon, hats, fans, and feather-beds, together with the inapplicableness of the story to any known event of actual history, never struck any editor of Scottish poetry, till, at a recent date, Mr. David Laing intimated his suspicions that *Sir Patrick Spence* and *Hardyknute* were the production of the same author. To me it appears that there could not well be more remarkable traits of an identity of authorship than what are presented in the extracts given from *Hardyknute* and the entire poem of *Sir Patrick*—granting only that the one poem is a considerable improvement upon the other. Each poem opens with absolutely the same set of particulars—a Scottish king sitting—drinking the blude-red wine—and sending off a message to a subject on a business of importance. Norway is brought into connection with Scotland in both cases. Sir Patrick's exclamation, 'To Noroway, to Noroway,' meets with an exact counterpart in the 'To horse, to horse,' of the courtier in *Hardyknute*. The words of the ill-boding sailor in *Sir Patrick*, 'Late, late yestreen, I saw the new moon'—a very peculiar expression, be it remarked—are repeated in *Hardyknute:*

> 'Late, late the yestreen I weened in peace,
> To end my lengthened life.'

The grief of the ladies at the catastrophe in *Sir Patrick Spence*, is equally the counterpart of that of the typical Norse lady with regard to the fate of her male friend at Largs. I am inclined, likewise, to lay some stress on the localities mentioned in *Sir Patrick Spence*—namely, Dunfermline and Aberdour—these being places in the immediate neighbourhood of the mansions where Lady Wardlaw spent her maiden and her matron days. A poet, indeed, often writes about places which he never saw; but it is natural for him to be most disposed to write about those with wh'ch he is familiar; and some are first inspired by the historical associations connected with their native scenes. True, as has been remarked, there is a great improvement upon *Hardyknute* in the 'grand old ballad of *Sir Patrick Spence*,' as Coleridge calls it, yet not more than what is often seen in compositions of a particular author at different periods of life. It seems as if the hand which was stiff and somewhat puerile in *Hardyknute*, had acquired freedom and breadth of style in *Sir Patrick Spence*. For all of these reasons, I feel assured that *Sir Patrick* is a modern ballad, and suspect, or more than suspect, that the author is Lady Wardlaw.

Probably, by this time, the reader will desire to know what is now to be known regarding Lady Wardlaw. Unfortunately, this is little, for, as she shrank from the honours of authorship in her lifetime, no one thought of chronicling anything about her. We learn that she was born Elizabeth Halket, being the second daughter of

Sir Charles Halket of Pitfirran, Baronet, who was raised to that honour by Charles II., and took an active part, as a member of the Convention of 1689, in setting the crown upon William and Mary. Her eldest sister, Janet, marrying Sir Peter Wedderburn of Gosford, was the progenitress of the subsequent Halkets, baronets, of Pitfirran, her son being Sir Peter Halket, colonel of the 44th regiment of foot, who died in General Braddock's unfortunate conflict at Monongahela in 1755. A younger sister married Sir Johu Hope Bruce of Kinross, baronet, who died, one of the oldest lieutenant-generals in the British service, in 1766. Elizabeth, the authoress of *Hardyknute*, born on the 15th of April 1677, became, in June 1696, the wife of Sir Henry Wardlaw of Pitreavie (third baronet of the title), to whom she bore a son, subsequently fourth baronet, and three daughters.

Having thus afforded to the assailant of the antiquity of the Romantic Scottish Ballads ample space for setting forth the main issues involved in the question, let us see what his arguments are worth.

Elizabeth, Lady Wardlaw of Pitreavie, the authoress of *Hardyknute*, and now the supposed creator of our whole Scottish Romantic Ballad literature, died at the mature age of fifty, in 1727, the year of the second George's accession to his father's throne; and from the acknowledged want of freedom and manifest betrayal of the "prentice hand" of a beginner in the *Hardyknute*,—which, after being repeatedly talked of and quoted, at length made its first appearance in print, in 1719,—we must assign the production of this and all subsequent ballads of Lady Wardlaw to, say, the last fifteen years of her life; or, more conveniently, to the reign of George I.

The style of that period, and the literature then in vogue are well-known; and so accordingly the critic, quoting a line of *Sir Patrick Spence*, says: "No old poet would use *faem* as an equivalent for the sea; but it was just such a phrase as a poet of the era of Pope would love to use in that sense." Consider then what are the circumstances of the production or recovery of those Romantic Ballads? From the era of Montgomery's "*Cherry and the Slae*," published in 1597, to the appearance of Watson's Collection of Scottish Poetry, between 1706 and 1711, whatever favour the genuine old national songs and ballads retained with the people, the printing-press entirely ignored them. They had been superseded by "Ane Compendious Booke of Godly and Spiritual Songs, collected out of sundrie parts of Scripture, with sundrie of other ballotis changed out of prophane sangs for avoiding of sin and harlotrie," &c., and before Lord Hailes, in 1765 once more introduced this curious production to Scottish readers, Ralph Erskine had written his once popular "Gospel Sonnets, or Spiritual

Songs," of which his biographer, writing in 1763, says "this poetical compend was so well relished that it hath undergone a multitude of impressions; and the demand for it is as great as ever." Of this, the twenty-fifth edition, issued from the Edinburgh press in 1797, and others in subsequent years, give unmistakeable evidence. Meanwhile, on the frail chances of the famous but long unheeded Bannatyne Manuscript in the Advocates' Library at Edinburgh, and the more voluminous M.S. volumes of Maitland of Lethington, in the Pepysian Library at Oxford, depended the recovery of many curious and early Scottish poems, of which no other copies are known to have existed. But the appearance of Watson's Collection, in 1706, is an index of that changed feeling which produced, at a later date, Allan Ramsay's volume of Scottish Songs in 1719; his "Evergreen, being a collection of Scots Poems wrote by the Ingenious before 1600;" and his "Tea Table Miscellany," a collection of songs, Scottish and English; issued in 1724 and subsequent years. In the wake of all these, appeared in England, Wharton's "History of English Poetry," in its three original quartos, between 1778 and 1781; and Percy's celebrated "Reliques of Ancient English Poetry," made their first debut, with timidly apologetic introduction to "a polished age," in 1765.

The critical collections of Ritson, Ellis, Herd, Jamieson, and even of Scott, belong to a different class, and to a later period, when the fruits of the earlier movement were being reaped in an entirely new school of original and genuine poetry; as well as in a reverential care for the fragments of antique song and ballad. In one characteristic, especially, the most noticeable of the earlier collections differ from those of this latter class, viz: in their notorious patch-work completeness. The poems are not genuine antique torsos, but "restorations," produced with little or no hint of the modern restorer's hand, excepting such as is unmistakeably present to the instructed ear of a more critical age. It seemed to the collectors of the early part of the eighteenth century, as incumbent a duty to patch and tinker the fragmentary relic of song and ballad that oral tradition had preserved, as to attempt their recovery. Hence we must be slow to reject a whole ballad as a modern compilation, because of modern phrases, ideas, and even whole stanzas, surreptitiously patched into its genuiue warp and woof. It is important also to bear in remembrance that the era of literary forgery,—embracing as it does the Rowley Poems of the gifted Chatterton, the "Ossian" of Macpherson, and the "Shakspeare Ma-

nuscripts" of Ireland,—is of a later date: 1760–1795; though the Hardyknute vellum, "found in a vault at Dunfermline," has a suspicious resemblance to the parchments subsequently recovered from the ancient chest of St. Mary Redcliff, at Bristol.

Mr. Chambers quotes incidentally, but without the slightest comment, the very important statement by Percy, which accompanies the first hint of Lady Wardlaw's authorship of *Hardyknute*, in the second edition of the "Reliques:"

"This account was transmitted from Scotland by Sir David Dalrymple (Lord Hailes), who yet was of opinion that part of the ballad may be ancient, but retouched and much enlarged by the lady above mentioned. Indeed, he had been informed that the late William Thomson, the Scottish musician, who published the *Orpheus Caledonius*, 1733, declared he had heard fragments of it repeated in his infancy before Mrs. Wardlaw's copy was heard of."

It is scarcely necessary to remind the reader that Lord Hailes—the author of "The Annals of Scotland," as well as the first editor of the famous Bannatyne MS.,—is one whose opinion relative to the antiquity of an ancient poem, or any part of it, ought to carry the very greatest weight. Mr.* Chambers only assigns to Lady Wardlaw an "improving revisal of *Gil Morrice*," being compelled thereto by the imperfect *Child Maurice* known to have existed in Percy's folio MS., supposed to be of Queen Elizabeth's time. But is he justified in assigning more to the modern authoress of *Hardyknute*, after the clear and definite opinion to the contrary of perhaps the very highest contemporary authority; excepting in regard to the prolix amount of new matter with which the original antique nucleus may have been overlaid. Of the poems collected by Sir Walter Scott in his "Minstrelsy of the Scottish Border," forty-three make their appearance for the first time in print. Two or three are of questionable antiquity or genuineness; but of the great majority no doubt has ever been entertained; though it is not questioned that, even on the lowest estimate of their age, many of them must have been orally transmitted through seven or eight generations.

The greater number of the stanzas of *Hardyknute* are undoubtedly spurious manufactures of the eighteenth century; and betray the

* In a subsequent note, Percy adds information about the pretended discovery of the *Hardyknute M.S.*, but this in no way affects the previously quoted opinion of Lord Hailes relative to parts of the ballad being ancient.

current jingle of the age just as clearly as what is Percy's own, in his *Friar of Orders Grey*, an olio penned, or rather patched up, after hearing Goldsmith read his "Hermit." Compare, for example, stanzas xxxvi, xxxvii, xxxviii, of *Hardyknute*—two of which are quoted above in the extract from our author,—with the ruling idea in Percy's and Goldsmith's ballads, and the reader will find curious evidence of the prevailing uniformity of thought, which the most ingenious efforts at an antique disguise cannot conceal; yet the original of the whole is the genuine old ballad, "*Gentle Herdsman, tell to me.*"

Very different in all respects from any characteristics of *Hardyknute* here referred to, is the beautiful fragment of *Sir Patrick Spence*. In the ampler form in which we now have that fine ballad, it has undoubtedly been patched by more than one modern hand; and, if such anachronisms as the "cork-heeled shoon," be not mere vulgar misreadings like the *blue-gilt* horn, manufactured out of the *bugelet* horn in *The Douglas Tragedy*; they are likely enough corruptions of very recent origin, rather testifying to the honest transcription of some contemporary oral version, than to the ingenious attempt at manufacturing an antique. As to the identity of authorship which Mr. Chambers discovers between the tedious common-places of *Hardyknute* and the terse vigour of *Sir Patrick Spence*, I am at a loss to discover any evidence, excepting that the manufacturer of the former was probably already acquainted with the latter,—which, unless altogether a forgery, was then treasured in some Scottish memories,—and had tact enough to borrow from it, but not skill or judgment enough to imitate it.

As to the additions supplied to Sir Walter Scott, and printed above in brackets, some of them betray a most suspicious correspondence,—two of them at least almost an identity,—with stanzas in "*The Dæmon Lover*;" and that that ballad owes nearly all its present completeness to some modern hand, we presume no genuine lover of ancient ballad literature has ever doubted. It is in the bracketed stanzas of this mint that the objectionable "faem" and "feather bed" of the critic occur.

As to the supposed discrepancies between the ballad and any historical narrative of the era of Alexander III, or of any later period; Mr. Chambers is fully justified in his criticisms by the comments and even the emendations of previous editors of the ballad; but the argument can only affect any attempts at assigning a precise date to the ballad. Should it turn out that *Sir Patrick Spence* has no counterpart in real

history, it will only have to be transferred, in that respect, to the same niche with *Chevy Chase,* of which Percy says "although it has no countenance from history, there is room to think it had originally some foundation in fact."

But another line of argument is next directed against the genuineness or antiquity of the Romantic Scottish Ballads, as follows:—

"Their style is elegant, and free from coarsenesses, while yet exhibiting a large measure of the ballad simplicity. In all literary grace, they are as superior to the generality of the homely traditionary ballads of the rustic population, as the romances of Scott are superior to a set of chap-books. Indeed, it might not be very unreasonable to say that these ballads have done more to create a popularity for Percy's *Reliques* than all the other contents of the book. There is a community of character throughout all these poems, both as to forms of expression and style of thought and feeling; jealousy in husbands of high rank, maternal tenderness, tragic despair, are prominent in them, though not in them all. In several, there is the same kind of obscure and confused reference to known events in Scottish history, which editors have thought they saw in *Sir Patrick Spence.*"

So says Mr. Chambers,—as if all these assigned characteristics, embracing some of the most universal materials of epic and dramatic verse were peculiar to one lady in that one age;—and then, after quoting *Young Waters; Edom o' Gordon; Gilderoy; Edward, Edward,* &c., at considerable length; he concludes by producing in contrast to these certain "typical ballads of the common class," with which to compare them. But—with all respect for the writer's judgment and experience,—the argument seems to us singularly illogical. *Sir Patrick Spence* and *Lord Fyvie* may be both genuine ancient ballads, and yet the one may be of the 14th or 15th and the other of the 17th century. If such be their diverse origins, we might as well compare Barbour and Drummond of Hawthornden, for any good result it is likely to lead to. The corruptions of later ages might greatly modify both, and all in one direction, but the difference between them at the last would still remain very wide. We have one beautiful little fragment of a lyric preserved by Wintoun, and belonging undoubtedly to the era immediately suceeeding that of Alexander III, and to which the supposed historical elements in *Sir Patrick Spence* have been assumed by some to refer. What process of vulgarising or modernising could give it any resemblance to such popular poems as Mr.

Chambers selects as typical? *Typical of what?*—of the taste and style of a particular and not very remote age, when a certain class of Scottish ballads were composed and recited; but not surely typical of all genuine Scottish ballads of all ages. Here is the authentic Scottish lyrical fragment of the thirteenth, or at latest, of the early part of the fourteenth century:

"When Alexander our king was dead,
That Scotland led in love and lee,
Away was sons of ale and bread,
Of wine and wax, of gaming and glee;

Our gold was changed into lead.
Christ, born into virginity,
Succour Scotland and remede
That stat is in perplexity."

It is not to be doubted that, prior to the eighteenth century,—when as we have seen, Scottish editors and collectors led the way in the recovery of ancient song and ballad literature, both of Scotland and England,—many old songs and ballads were current among the people, which had been handed down orally, from generation to generation, changing and modernising with the familiar characteristics of the age: just as medieval painters and sculptors invariably rendered all ancient and scripture subjects in the costume of their own day. In this way, "faem," "fans," "feather beds," and "cork-heeled shoon," might all find their way into an old ballad, without affording any ground for suspecting it to be a forgery. When however such poems after passing through the alembic of popular tradition for successive generations, were at length committed to writing, the form they assumed depended a good deal on the transcriber. An old dame could be prompted in her recitation where lacunæ occurred; and when she had done her best, the transcriber's work began. Fragmentary songs or ballads were in little esteem from the days of Allan Ramsay to Percy, and their collections only illustrate the process of eking and patch-work everywhere going on. But the original collectors were few, rarely more than one or two to a district. Hence the style which tradition would necessarily give to the oral verse of a locality, was supplemented by the style in which the tinkering of the collected songs and ballads of the district was carried out, alike as the work of one or two enthusiastic gleaners, and of the age in which they wrought. Hence, also,

the somewhat monotonous re-adaptation of certain borrowed formulæ, due perhaps as frequently to the promptings of the transcriber, as to the treacherous memory of the reciter, or the limited invention of the original minstrel; while to the Lady Wardlaws, and other collectors given to versification, may very safely be ascribed such stanzas as unmistakeably betray the style of their own time. Take, for example the following stanzas in Scott's version of *The Young Tamlane,* in which the hero describes to his lady love, how he and others who have been spirited away, deport themselves in Fairyland:

> Our shapes and size we can convert
>   To either large or small;
> An old nut-shell 's the same to us
>   As is the lofty hall.
>
> We sleep in rose-buds soft and sweet,
>   We revel in the stream;
> We wanton lightly on the wind,
>   Or glide on a sunbeam.
>
> And all our wants are well supplied,
>   From every rich man's store,
> Who thankless sins the gifts he gets,
>   And vainly grasps for more.

The first two verses belong in their ideas to the class of sylphs and gnomes which Pope's "Rape of the Lock" had introduced into fashionable drawing rooms; while the last stanza has not only the cadence, but the very mode of thought rendered familiar to all, by Goldsmith's beautiful ballad. But to conclude therefore, as Mr. Chambers seems inclined to do, that the whole ballad belongs to the Pitreavie mint, is to confound styles as dissimilar as ever sufficed, by their contrast in form and ideas, to betray the admixture of old and new materials.

Again, Mr. Chambers, having given full play to his newly developed literary scepticism, proceeds in the following fashion to demolish in like manner the claims to antiquity of any more recently recovered ballads:

"It is now to be remarked of the ballads published by the successors of Percy, as of those which he published, that there is not a particle of positive evidence for their having existed before the eighteenth century. Overlooking the one given by Ramsay in his *Tea-table*

Miscellany, we have neither print nor manuscript of them before the reign of George III. They are not in the style of old literature. They contain no references to old literature. As little does old literature contain any references to them. They wholly escaped the collecting diligence of Bannatyne. James Watson, who published a collection of Scottish poetry in 1706–1711, wholly overlooks them. Ramsay, as we see, caught up only one. Even Herd, in 1769, only gathered a few fragments of some of these poems. It was reserved for Sir Walter Scott and Robert Jamieson, at the beginning of the nineteenth century, to obtain copies of the great bulk of these poems—that is, the ballads over and above the few published by Percy—from A LADY—a certain 'Mrs. Brown of Falkland,' who seems to have been the wife of the Rev. Andrew Brown, minister of that parish in Fife,—is known to have been the daughter of Professor Thomas Gordon, of King's College, Aberdeen,—and is stated to have derived her stores of legendary lore from the memory of her aunt, a Mrs. Farquhar, the wife of a small proprietor in Braemar, who had spent the best part of her life among flocks and herds, but lived latterly in Aberdeen. At the suggestion of Mr. William Tytler, a son of Mrs. Brown wrote down a parcel of the ballads which her aunt had heard in her youth from the recitation of nurses and old women. Such were the external circumstances, none of them giving the least support to the assumed antiquity of the pieces, but rather exciting some suspicion to the contrary effect."

On the supposition of those ballads being genuine, and chiefly recovered from the oral conservation of one or two isolated Scottish districts, could any account of such recovery present a more natural aspect. Instead of a successful forger flooding the eagerly credulous collectors with the coveted ballad-prizes: Ramsay gets hold of one; Herd, following towards the close of the century, gathers portions of several; and then the full harvest of them, as of most other classes of Scottish Ballads, is reaped by Jamieson and Scott. Meanwhile Mrs. Brown, of whom we have a very credible and likely account, had been diligently doing her best and without some such collectors of legendary lore it is difficult to see how traditionary songs and ballads were to be recovered at all.

That Mrs. Brown of Falkland had as genuine a love for old ballad literature as either Ramsay or Percy we do not doubt; and that when a line or even a stanza was wanting, she hesitated just as little as they

did at a bit of pious patch-work is extremely probable; but, for the rest, the same course of argument will equally convert "the palpably old historical ballads," or any of those of the Border Minstrelsy, into modern antiques. If Lady Wardlaw or Mrs. Brown could write such wonderful romantic ballads, Sir Walter Scott, and more than one of his correspondents were fully equal to the task of manufacturing sixteenth and seventeenth century historical ballads to any amount. Yet look at Allan Cunningham's work in the same line. Never, surely was poet better fitted by natural gifts and peculiar circumstances for the successful forgery of Nithsdale and Galloway antiques of the sort required. He tried his best, yet who could now be deceived with his *Lord's Marie*, his *Bonnie Lady Annie*, or any other of the ingenious imitations that threw the credulous Cromek into such ecstacies?

The truth is, that Mr. Chambers, having got hold of a really interesting and too much neglected theme, has allowed it fairly to run away with him; as we are all too apt to do with our hobbies. Moreover, the very candour and straight forwardness for which Robert Chambers is admired by all who have the pleasure of knowing him, tempts the editor of "the Scottish Ballads" of 1829, all the more strongly to set forth his recantation of an abandoned faith, in publishing the newly adopted views of 1859. Let us then quote at length, the concluding remarks with which the new views on the epoch and authorship of the Romantic Scottish Ballads are summed up:

"Let it never be objected that, if any one person living in the reigns of Queen Anne and George I. had composed so many fine poems, he or she could not have remained till now all but unknown. In the first half of the present century, there appeared in Scotland a series of fugitive pieces—songs,—which attained a great popularity, without their being traced to any author. Every reader will remember *The Land of the Leal, Caller Herring, The Laird o' Cockpen, The Auld House*, and *He's ower the Hills that I lo'e weel.* It was not till after many years of fame that these pieces were found to be the production of a lady of rank, Carolina Baroness Nairn, who had passed through a life of seventy-nine years without being known as a song-writer to more than one person. It was the fate of this songstress to live in days when there was an interest felt in such authorships, insuring that she should sooner or later become known; but, had she lived a hundred years earlier, she might have died and left no sign, as I conjecture to have been the case with the author of this fine group of ballads; and

future Burnses might have pondered over her productions, with endless regret that the names of their *authors* were 'buried among the wreck of things that were.'

"If there be any truth or force in this speculation, I shall be permitted to indulge in the idea that a person lived a hundred years before Scott, who, with his feeling for Scottish history and the features of the past generally, constructed out of these materials a similar romantic literature. In short, Scotland appears to have had a Scott a hundred years before the actual person so named. And we may well believe that if we had not had the first, we either should not have had the second, or he would have been something considerably different, for, beyond question, Sir Walter's genius was fed and nurtured on the ballad literature of his native country. From his *Old Mortality* and *Waverley*, back to his *Lady of the Lake* and *Marmion*; from these to his *Lay of the Last Minstrel*; from that to his *Eve of St. John* and *Glenfinlas*; and from these, again, to the ballads which he collected, mainly the produce (as I surmise) of an individual precursor, is a series of steps easily traced, and which no one will dispute. Much significance there is, indeed, in his own statement, that *Hardyknute* was the first poem he ever learned, and the last he should forget. Its author—if my suspicion be correct,—was his literary foster-mother, and we probably owe the direction of his genius, and all its fascinating results, primarily to her."

Such are the terms with which Mr. Robert Chambers closes his bold and ingenious onslaught on the accepted epochs and authorships of the romantic Scottish Ballads. We doubt not the inquiry he has thus originated, will be well sifted by friend and foe, ere it is allowed to rest. Nor need the controversy kindle Scottish zeal into undue heat; for after all, the question is only whether our national romantic ballads were written by a Scottish Lady, some hundred and forty years ago, or by nameless Scottish minstrels of earlier centuries.

That Elizabeth, Lady Wardlaw is the authoress of *Hardyknute* we fully believe, whatever fragmentary relics derived from an earlier age may have suggested the theme, and controlled its form. That she was one peculiarly fitted to become such a gatherer, and transmuter of imperfect traditional song and ballad literature, as characterised the Scottish collectors of the eighteenth century, may also be affirmed with much probability; and consequently that her hand may be more or less traceable in a whole series of romantic ballads is far from un-

likely; especially since internal evidence proves the manipulation of some modern hand. But that Lady Wardlaw, who died in 1727, with no other poetical repute than the authorship of the stiff and tedious Hardyknute,—a poem bearing in nearly every stanza unmistakeable traces of its modern origin,—is nevertheless the authoress of all the most tender and pathetic of what are designated the romantic Scottish ballads, is a theory which few will be inclined to adopt on such slender evidence as the parallelisms or repetitions now brought forward. Yet on such evidence Mr. Chambers would assign with more or less confidence to Lady Wardlaw the authorship of (1) *Sir Patrick Spence;* (2) *Gil Morrice;* (3) *Edward, Edward;* (4) *The Jew's Daughter;* (5) *Gilderoy;* (6) *Young Waters;* (7) *Edom o' Gordon;* (8) *The Bonnie Earl of Murray;* (9) *Johnie of Bradislee;* (10) *Mary Hamilton;* (11) *The Gay Gos-hawk;* (12) *Fause Foodrage;* (13) *The Lass of Lochryan;* (14) *Clerk Saunders;* (15) *The Douglas Tragedy;* (16) *Willie and May Margaret, or the Mother's Malison;* (17) *Young Huntin;* (18) *Tamlane;* (19) *Sweet Willie and Fair Annie;* (20) *Lady Maisry;* (21) *The Clerk's Twa Sons of Owsenford;* and (22) *The Heir of Linne.*

By the bold course of thus ascribing every thing connected with Scottish ballad poetry that is marked by dignity, refinement, and tender pathos, to the one source, the ingenious critic effectually disarms his opponents, who might otherwise point to such wide correspondence in proof at least of the genuineness of most of the first recovered stanzas of *Sir Patrick Spence.* Ruder versions or fragments of some of the ballads thus assigned to Lady Wardlaw's parentage, are known to be ancient; but what of that? "A ballad," says Mr. Chambers, "named *Burd Ellen,* ressembling *Fair Annie* in the general cast of the story, is a Scottish modification of the ballad of *Child Waters,* published by Percy, from his folio manuscript, 'with some corrections.' It probably came through the same mill as *Gil Morrice,* though with less change,—a conjecture rendered the more probable, for reasons to be seen afterwards, from its having been obtained by Mr. Jamieson from Mrs. Brown of Falkland."

These reasons have been already quoted, and they are singularly unsatisfactory. Beyond the fact that Mrs. Brown of Falkland seems to have been the wife of a Fifeshire minister, and therefore to have had her residence in the district where the supposed productions of Lady Wardlaw's remarkable poetical genius are assumed to have first

seen the light, it is not pretended that there is any evidence of the two ladies having had the slightest connection. No intercourse between mutual friends, or relatives descended from either, is attempted to be traced. The whole ground for so sweeping an inference is that certain ballads, recovered from the same districts of Scotland, at various periods during the eighteenth century, betray a correspondence of thought, feeling and expression; and also some unmistakeable traces of modern interpolations in the style of the artificial verse of that age.

There are one or two additional points to be noted in reference to the authoress of *Hardyknute.* Lady Wardlaw, according to the narrative of Percy, played the part of a coy poetess, as others before and since her time have done. "A suspicion arose that it was her own composition. Some able judges asserted it to be modern. The lady did in a manner acknowledge it to be so. Being desired to show an additional stanza, as a proof of this, she produced the two last, beginning with *There's nae light, &c.*, which were not in the copy that was first printed." This is very much of a counterpart to Lady Anne Lindsay's proceedings about her "*Auld Robin Gray,*" a far superior production to *Hardyknute;* but though Lady Anne composed a good many other pieces, none of them approached her first happy hit. There is not the slightest proof that Lady Wardlaw exhibited more than the usual coyness of lady poets. Mr. Hepburn of Keith stated he was in the house with her when she wrote her Norse poem. Several of her descendants knew well about it, as George Chalmers tells, on the authority of Sir Charles Halket, in his *Life of Allan Ramsay;* and Mr. Chambers quotes and italicises the following passage: "Sir Charles Halket and Miss Elizabeth Menzies concur in saying that Lady Wardlaw was a woman of elegant accomplishments, *who wrote other poems,* and practised drawing, and cutting paper with her scissors, and *who had much wit and humour,* with great sweetness of temper." It is manifest therefore that the mystery of the authorship of *Hardyknute* was from the first no mystery to intimate friends, and to the Pitreavie family circle. Moreover, whatever amount of secrecy the poetess encouraged during her lifetime, we see that her immediate descendants exerted themselves to establish her claims to an authorship which they regarded as reflecting honour alike on her and on themselves; and yet we are required to believe that while acknowledging, and even producing metrical proofs in confirmation of her authorship of what Mr. Chambers designates as "to modern taste, a stiff and poor composi-

tion," Lady Wardlaw so effectually concealed the subsequent authorship of twenty-two of the finest, most tender and vigorous, of all the romantic ballads of Scotland, from her family and her descendants, that it is left for an ingenious literary antiquary, some hundred and thirty years after her death, to make the discovery from internal evidence alone; and to assure us that "The hand which was stiff and somewhat puerile in *Hardyknute,* had acquired freedom and breadth of style" in those deserted foundlings of her muse! The lady, be it remembered, was in her forty-second year when her first *peurile* poem was printed, and still older when she claimed its authorship by the production of additional stanzas, which are fully as puerile as the rest. As her death took place, only eight years after the former date, and with a shorter interval after the latter, the utmost period we can allow for the development of the "puerile style" of *Hardyknute* into the "freedom and breadth of style," of the supposed twenty-two later productions is singularly brief; especially when we consider the mature age of the supposed authoress. The idea is just one of those plausible fancies which prove so temptingly fascinating to the originator, from their very boldness, that we do not wonder at seeing the ample expansion of the first sceptical anatomising of *Sir Patrick Spence,* into the final comprehension of the whole romantic ballad literature of Scotland under the same Pitreavie classification. It required a peculiarly calm temperament to resist the seductions of a theory which, if established, would give to Scottish literature a Chattertonian poetess, little, if at all, inferior in intellectual rank to "the marvellous boy" whom the world accredits with the authorship of the Rowley manuscripts.

D. W.

Description of a deformed fragmentary Skull, found in an ancient Quarry-cave at Jerusalem; with an attempt to determine by its configuration alone, the ethnical type to which it belongs. By J. Aitken Meigs, M. D. Philadelphia: Merrihew and Thompson, 1859.

Dr. Meigs, the able cataloguer of the Morton Collection of Crania, in the Cabinet of the Academy of Sciences of Philadelphia, embodies in this elaborate and careful thesis the results of an ingenious exhaustive process by which he has aimed at determining the

race, by the form and characteristics, in a skull obtained under unusual circumstances. In 1857 Mr. J. Judson Barclay presented to the Academy a human skull, in an imperfect condition, brought from a remarkable cave visited by him at Jerusalem, with the following results:—

Having received some information of the existence of a very extensive cave near the Damascus gate at Jerusalem, (entirely unknown to Franks,) Mr. Barclay, in conjunction with his father and brother, resolved upon its exploration. Accordingly, having obtained permission to this effect, from the Nazir Effendi, they repaired to the cave, the mouth of which is situated directly below the city wall, and the houses on Bezetha. They found the wall at this spot about ten feet in thickness. Through a narrow, serpentine passage which traverses it they gained an entrance into the cave. The length of the cavern they estimated at seven hundred and fifty feet, and the circumference upwards of three thousand feet. The roof is supported by numerous regular pillars hewn out of the solid limestone rock. The floor from the entrance to the termination forms an inclined plane, the descent of which is in some places very rapid. About 100 feet from the entrance a very deep and precipitous pit was discovered containing a human skeleton; supposed to be that of some unfortunate who had fallen headlong down and broken his neck, or rather his skull, judging from the fracture which it exhibits. The bones, of almost giant proportions, gave evidence, from their decayed state, of having remained in that position for many years. The skull, unlike the rest of the skeleton, was in a remarkable state of preservation. Numerous crosses on the wall indicated that the devout Pilgrim or Crusader had been there; and a few Arabic and Hebrew inscriptions —too much effaced to be deciphered,—proved that the place was not unknown to the Jew and the Arab. The explorers found many intricate, meandering passages leading to immense halls as white as the driven snow, and supported by colossal pillars of irregular shape: some of them placed there by the hand of nature, others of them evidently by the stone quarriers to prevent the tumbling in of the city. From their explorations the party concluded that this cavern and the Grotto of Jeremiah, two or three hundreds yards distant, originally constituted one immense cave which was formerly the great quarry of Jerusalem.

The cave appears, therefore, to be a very old one. An allusion

to it under the name of the 'Cotton Grotto' is made by Kadi Mejr-ed-din in an Arabic MS., entitled 'The Sublime Companion to the History of Jerusalem and Hebron,' and bearing date A.D. 1495. A gentleman who entered the cave subsequently to the visit of the Messrs. Barclay, states, in the 'Boston Traveller,' that though its existence was long suspected, 'nothing was positively known regarding it, as it has been kept carefully closed by the successive governors of Jerusalem. The mouth of the cavern was probably walled up as early as the times of the crusades, to prevent its falling into the hands of a besieging army; earth was thrown up against this wall, so as effectually to conceal it from view, and it is only upon the closest scrutiny that the present entrance can be perceived.'

The circumstances under which the skull was discovered afforded no clue to its ethnic classification; nor does its condition furnish any very decisive guide to the era to which it should be referred. It is confidently believed by those who have familiarised themselves with the minute characteristic details of comparative craniography, that by these alone ethnical types can be determined. A skull now in the collection of the Academy of Sciences at Philadelphia, and figured in Dr. Meigs' Catalogue of Human Crania, No. 1352, as ancient Phœnicean, was sent by M. Fresnel, the celebrated archæologist, to the late Dr. Morton, without the slightest information as to where, or the circumstances under which, it was found. After careful study of its characteristics, Dr. Morton pronounced it to be Phœnician. He afterwards learned from Fresnel that it was found in the sepulchral cave of Ben Djemma, in the Island of Malta, and probably belonged to an individual of that race, which, in the most remote times, had occupied the northern coast of Africa and the adjacent isles. It thus appears that Dr. Morton, guided by osteologic characters alone, was enabled to announce the correct geographical locality of this skull, and perhaps also its true ethnic value; though of this latter point Dr. Meigs expresses some doubts, arising from the remarkable resemblance which this skull bears to that of a wandering Chingà of Transylvania, depicted in Blumenbach's Decades (Tab. xi.). In like manner, some time before his death, Dr. Prichard sent to Prof. Retzius two human crania, requesting an opinion as to the race to which they belonged. He pronounced one of them to be Roman and the other Celtic, and was informed by Prichard that he was in all probability correct, for the two skulls had been dug up in an old

battle-field at York, England, where the ancient British Celts, had been vanquished by the Romans.

Encouraged by such examples of success, Dr. Meigs proceeded to apply the tests which his experience in comparative craniology placed at his command. The skull, however, is peculiar, and so far as his experience could guide him, unique. Among all the 1045 crania in the collection of the Academy, none presented a counterpart to it. Its most remarkable feature is that the occipital bone rises vertically from the posterior margin of the great foramen to meet the parietalia, which bend abruptly downward between their lateral protuberances. This striking peculiarity, therefore, gives to a skull brought from an ancient quarry-cave at Jerusalem some of the most typical characteristics of Peruvian Crania. After minutely describing the appearance which the several bones present, Dr. Meigs expresses his conviction that the head has been artificially deformed by pressure applied to the occipital region during youth; thus supplying an interesting illustration of the practice in the old world of the same custom of distorting the human head, which was long regarded as peculiar to the American aborigines.

After marshalling all the probable ethnic claimants for this remarkable cranium, and assigning reasons for rejecting each; Dr. Meigs shows that it unites some of the most characteristic elements of the Mongolian and the Sclavonian head, while differing in some respects from both; and he finally concludes that it may be refered—not as a positive and indisputable conclusion, but as an approximation to the truth,—to the people and the region about Lake Baikal. Through the Sclaves and Burats of that region the short-headed races of Eastern Europe graduate apparently into the Kalmucks and Mongols proper of Asia; and here probably is a remarkable example of an artificially modified cranium of that transitional people of Lake Baikal.

The whole paper is an interesting one to those engaged in similar studies, and is marked throughout by the candour and temperate caution so specially needed in the present state of ethnological investigation.

D. W

SCIENTIFIC AND LITERARY NOTES.

GEOLOGY AND MINERALOGY.

NEW AMERICAN TRILOBITES: BY PROFESSOR JAMES HALL.

The accompanying descriptions of three new Trilobites from the Hudson River group of Vermont, have been kindly forwarded to us by Professor Hall, of Albany:

"The Trilobites most common in the shales of the Hudson River Group are *Triarthrus Beckii** and *Calymene senaria* = *C. Blumenbachii?* I have likewise described two species of *Olenus* in the first volume of the Palæontology of New York; but these are rare in most localities of the rocks of this period.

Some years since, during the progress of the Geological Survey of Vermont, by Rev. Z. Thompson, some specimens of Trilobites were obtained from the shales of this age in the town of Georgia; and these were subsequently placed in my hands. The Survey having since passed under the direction of Professor Hitchcock, I postponed the publication of the descriptions, fearing it might not be agreeable to him; but having now not only his approval, but his express desire that I would publish them, I give below the following species, preliminary to a more complete description and illustration.

Olenus Thompsoni. (*n. s.*)

General form ovate, the length and breadth being nearly as six to five. Head broad lunate, with the postero-lateral angles much extended; the width from the centre to the outer margin of the eye almost equal to the width of the cheek. Eyes (which are much crushed in the specimen) elongate semioval, equal in length to the space between the anterior angles and the frontal margin: glabella distinctly lobed, narrower in front.

Thorax with the lateral lobes about once and a half as wide as the middle lobe, consisting of fourteen articulations, the third one of which is much longer than the others, and curving downwards with an extension reaching as far as the line of articulation of the seventh rib. The posterior articulations are bent abruptly backwards, so that the free extremities are parallel with the axis. Pygidium small, pointed, without visible rings, and having a narrow ridge running down the centre.

The description is chiefly drawn from an impression in slate, and a cast made from the same, together with some fragments of the same species.

Geological position.—In the shales in the upper part of the Hudson River group.

Olenus Vermontana. (*n. s.*)

General form elongate; the posterior extremity obtuse. Head semioval, twice as wide as long, the posterior angles produced in short acute spines. Eyes narrow elongate; the space from the centre of the head, to the outer margin of the eye much greater than the cheek, and the distance from the anterior angle of the

* Apparently confined (or nearly so,) in Canada, to the underlying Utica Slate.—E. J. C.

eye to the frontal margin, less than the length of the eye. Glabella lobed; hypostoma broad oval.

Thorax imperfect, preserving six articulations and part of the seventh; the middle lobe wider than the lateral ones. The third articulation is much broader towards and at its lateral margin, and is prolonged obliquely downwards in a sharp spine, which reaches below the seventh articulation; the lateral extremities of the other articulations produced in short acute spines.

Another fragment, which is apparently of the same species, preserves eleven articulations of the thorax and the pygidium. The upper articulations are imperfect at their extremities; the last one is bent abruptly downwards, and terminates in a long spine on each side, reaching below the pygidium. Pygidium semioval; the axis marked by four annulations, the two upper of which are faintly indicated in the lateral lobes.

This species differs from the preceding, in its proportionally narrow form, the relative proportions of the parts of the head, and the short acute posterior spines. The comparative width of the middle and lateral lobes of the thorax is a very distinguishing feature.

Geological position.—In the shales of the upper part of the Hudson River group.

Peltura (Olenus) Holopyga. (n. s.)

Entire form elongate subelliptical, having a length of about twice and a half the width. Head somewhat semielliptical; the posterior angles produced in long spines. Glabella strongly lobed, its length a little greater than its greatest breadth; the entire breadth of the head, when entire, being about twice as great as the length. Hypostoma wider than long.

Thorax with eleven articulations; the middle lobe prominent, and about twice as wide as the lateral lobes; the articulations strong, rounded above, and each one marked in the centre by a node (or the base of a spine which has been broken off in the specimens examined). Articulations of the lateral lobes short (the extremities of the upper ones broken off in the specimen); the lower ones bending abruptly downwards, and terminating in spiniform processes, the last pair being prolonged much beyond the extremity of the pygidium.

Pygidium longitudinally semielliptical; the middle lobe marked by three annulations, and a fourth obscure one above the terminal lobe; lateral lobes flat and plain, the exterior margin apparently free from ornament or inequality.

This species appears to belong to the genus *Peltura*, taking the figures of *Olenus (Peltura) scarabœoides* as the type of the genus.* Our specimen differs from that one in the absence of the obscure crenulations or inequalities upon the limb of the pygidium, which is regarded by Pictet as important. The number of segments of

* This species, the *Entamostraticites scarabœoides* of Wahlenberg, 1821 (*scarabœorum vel aliorum vaginipennium animale vestigia:* Bromel in Act. Litt. Upsal. 1729.) has apparently been refigured from the same specimen, or from the same figure throughout, by subsequent authors; and the original appears to have been deprived of the cheeks, the frontal limb, and the posterior cephalic spines. The eye-tubercle, or the palpebral lobe, having collapsed as in our specimen, gives but a partial representation of the entire animal.

the thorax, if a constant character, seems much more important, and furnishes a more marked feature for the separation from *Olenus*.

Geological position.—In the shales of the Hudson River group.

LOCAL GEOLOGICAL NOTES: BY E. J. CHAPMAN.

Presence of Columnaria alveolata and Stromatocerium rugosum in Trenton Limestone.—Until a comparatively recent period these fossils were considered eminently characteristic of the Black River Limestone. They were not known, indeed, to pass upwards out of that division: a condition which perhaps still obtains in the geology of New York. In parts of Lower Canada, however, Sir William Logan, and the other officers of the Survey, have discovered these forms in direct association with fossils of the Trenton Limestone, properly so called; and in the shale of Tennessee, Prof. Stafford, of the Cumberland University, has found them occupying a high position amongst the Trenton beds. But, so far as regards Western Canada, I am not aware that these types have hitherto been recognised above the Black River subdivision of the great Trenton group. It may not be, therefore, without interest to state, that I have lately found *Columnaria alveolata* in the vicinity of Belleville, C. W., and examples of both *Columnaria alveolata* and *Stromatocerium rugosum* at Shannonville on the Shannon or Salmon River, about eight miles east of Belleville: these fossils, at each locality, accompanying well-known Trenton types. Some additional remarks on this subject will be given in a review of the geology of Belleville and its vicinity, to appear in an early No. of the Journal.

Silicate of Iron in the Limestone Beds of Lake St. John, Rama, C. W.—At the northern extremity of Lake St. John—a small lake lying a short distance east of Lake Couchiching in Rama Township, C. W.,—the junction of the Laurentian and the Lower Silurian strata may be seen; the gneiss rocks of the former dipping at an angle of about 25° to the N. E., whilst the Silurian strata dip at a very slight angle in an opposite direction. A bed of light greenish-brown sandstone, about two feet thick, appears at the base of the Silurian strata, and siliceous limestones, with a few Black River (and perhaps Chazy?) fossils, lie conformably on this. In the bottom beds, more especially, of these siliceous limestones, a number of curious bright-green streaks and markings occur. These at first sight appear to indicate the presence of copper pyrites or other copper ores in the rocks in question. I find them to consist, however, of hydrated silicate of iron, arising from the decomposition of iron pyrites; the green substance at least, in some places, is collected around a minute cube or other nucleus of pyrites, altered into the brown or hydrated sesqui-oxide. In no case have I been able to detect in these markings the slightest trace of copper. The presence, on the other hand, of silica, oxide of iron, and a little water, is easily made out.

MINERALOGICAL NOTICES.

[Condensed, with additional remarks, from various papers in recent Numbers of Poggendorff's Annalen.]

Isomorphism of Silica, Zirconia, and Stannic Acid.—G. Rose, from the isomorphous relations (as discovered by Marignac) of the Fluo-stannates and Fluo-silicates, considers the isomorphism of silica and stannic acid an established fact; and

makes, consequently, the atomic constitution of Silica $= SiO^2$. Silica and Stannic Acid in their mineral forms, it is well known, crystallize in different systems, but G. Rose seeks to establish a crystallographic connexion between them by the intervention of Zircon, a mineral long known to be identical in form with cassiterite, SnO^2. He makes the formula of Zirconia $= ZrO^2 +$; and that of Zircon $ZrO^2 + SiO^2$; viewing the latter as an isomorphous combination of Silica and Zirconia; and, regarding it by inference consequently, as a proof of the dimorphism of silica; or, in other words, as an example of silica crystallising in the dimetric system. This reasoning, however, appears to be somewhat forced. Zircon crystallises in the dimetric system, in all probability, under the crystallographic influence (so to say) of the Zirconia which forms its more essential or predominating constituent. That one of the components in crystal compounds frequently exerts an influence of this kind, is an assumption now generally received. And again, by legitimately following out the argument of Gustav Rose, we ought equally to consider silica a *sesquioxide*, seeing that it occasionally replaces alumina, not only in such compounds as Augite and Hornblende, but also in the Staurolites. With regard to the latter, Professor Rose has himself stated in another place (*Krystallo-chemische Mineralsystem*, p. 77,) that the only way of explaining their variable composition, is to assume the isomorphism of silica and alumina. And if, as he states further in objection to this, no examples of these bodies have yet been found in identical forms, the same argument still holds good with respect to silica and stannic acid on the one hand, and silica and zirconia on the other. The modern progress of mineralogy tends to bring out very prominently two facts:—First, that we should make a careful distinction between simply isomorphous and truly *vicarious* bodies; and secondly that the *assumed* atomic constitutions of mineral compounds must be allowed no preponderating place in questions belonging to the philosophy of that science.

Crystal Form of Oxide of Copper.—Dr. Jenzsch has described some crystals of Black Oxide of Copper from some smelting works near Freiberg. They were obtained from furnaces in which argentiferous copper ores are roasted with common salt, and they are considered due to the alteration of volatilized chloride of copper. They belong to the Trimetric system. Simple crystals are rare, twins and compound groups predominating. The twin-face is one of the planes of the predominating rhombic prism, and the re-entering angle equals 160° 42′ 30″. The prism-angle itself ($V : V = I : I$, Dana $= P\infty : P\infty$. Naumann) $=99° 38' 45''$, and $80° 21' 15''$, the latter being, of course, just one-half the amount of the re-entering angle. The crystals are mostly tabular, from the abnormal development of two of the opposite V faces or vertical planes of the rhombic prism. Oxide of copper (Cu O.) is thus shewn to be dimorphous, if not trimorphous. Becquerel obtained it in monometric tetrahedrons by the fusion of the finely comminuted oxide with potash; and the Tenorite from the lava of Vesuvius is looked upon as Hexagonal by some observers. Very probably, however, as pointed out by Dr. Jenzsch, the six-sided scales in which the latter chiefly occurs, are really Trimetric. Dana's Melaconite, another form of Cu O from Lake Superior, sometimes occurs in small cubo-octahedrons, it will be remembered; but these have been regarded (although doubtfully) as pseudomorphs derived from the red oxide $Cu^2 O$. The crystals

described by Dr. Jenzsch, exhibit a brilliant metallic lustre, with iron-black colour and unchanged streak. H. about 4.0; Sp. gr. = 6.451.

Magnoferrite.—Rammelsberg proposes this name for the so-called octahedral iron-glance from Vesuvius: a combination, according to his analyses, of sesqui-oxide of iron and magnesia. Specimens varying in sp. gr. from 4.56 to 4.65, yielded results closely approaching to sesqui-oxide of iron 85.71, magnesia 14.29; and sesqui-oxide of iron 84.21, magnesia 15.79. The former corresponds to 2 MgO, 3 Fe^2O^3; the latter to 3 MgO, 4 Fe^2O^3. Magnoferrite must not be confounded with the well-known specular iron ore from Vesuvius, which occurs in thin leaves and small crystal aggregations. A specimen analysed by Rammelsberg, yielded: sesqui-oxide of iron 98.05, magnesia 1.40. The formulæ given above throw the magnoferrite out of the great Magnetite and Spinel series, a somewhat unexpected result. The term *Talcoferrite* or *Magnesioferrite* appears to us less likely to create misconception, than that bestowed on this substance by Rammelsberg.

Franklinite.—This mineral has also been newly analysed by Rammelsberg with results somewhat different from those previously obtained by Abich, and by Dickerson. The mean of several analyses shewed: sesqui-oxide of iron 64.51, oxide of maganese 13.51, oxide of zinc 25.30. There results = 3 RO, R^2O^3, a formula considered by Rammelsberg to be isomorphous with the spinel formula RO, R^2O^3.

Cerite.—Rammelsberg has also analysed several specimens of Cerite with the following (mean) results: Silica 19.18, oxide of cerium 64.55, oxides of lanthanium and didymium 7.28, lime 1.35, oxide of iron 1.54, water 5.71. The oxygen-ratios of the water, protoxides, and silica = 5.09, 11.17, 9.96—from which Rammelsberg deduces the formula 2 RO, SiO^2 + HO. As the earlier analyses of Hisinger and Hermann shewed respectively 9.60 and 9.10 per cent. of water, whilst those of Kjerulf and Klaproth shewed 5.29 and 5.10 per cent., agreeing closely in that respect with his own, Rammelsberg starts the question as to whether there may not be two distinct minerals included under Cerite. This mineral, however, so rock-like in its characters, is exactly one of those in which we might expect to find a certain diversity of composition.

Boracite and Stassfurthite.—Dr. Julius Potyka has analysed examples of these substances. His analyses give for Boracite, the formula 2 (3 MgO, 4 BO^3) + Mg Cl; and for Stassfurthite, the same with one atom of water. The latter is identical with that previously deduced by Heintz.

Triphylline.—A new analysis of this mineral (from Bodenmais in Bavaria) has been published by F. Oesten. This analysis, which seems to have been very carefully performed and on pure material, leads to the same formula as that given by Fuchs, viz.: 3 RO, PO^5. This differs very materially from the results obtained by Rammelsberg.

Classification of Meteorites.—An interesting classification of meteorites has been drawn up by the Baron von Reichenbach. It is too long for insertion in the present place, but a condensed analysis of it will be given in our next series of Notes.

PUBLICATIONS.

The following publications, in this department, have been received since the last

issue of the Journal:—1. "Seventh Supplement to Dana's Mineralogy," by the Author [Prof. Dana], from the American Journal of Science and Arts for July, 1859. The publication of these valuable 'Supplements' in a separate form—in sets of five or six for example,—would be exceedingly welcome to all interested in the progress of Mineralogy. 2. "The Old Glaciers of Switzerland and North Wales," by A. C. Ramsay, F.R.S., etc. A review of this interesting and gracefully illustrated essay will appear in an early number of the Journal. 3. "The Microscopic Structure of some Canadian Limestones," by Professor Dawson, LL.D.; and 4. "The Natural History of the Gulf of the St. Lawrence, and Distribution of the Mollusca of Eastern Canada," by Robert Bell, Jr., are from the June number of the Canadian Naturalist. Prof. Dawson's Paper is illustrated by several wood engravings shewing the minute organisms, and the general microscopic appearance, of various specimens of Trenton and Chazy limestone from the neighborhood of Montreal. Mr. Bell's Essay contains a very elaborate exposition of the vertebrated, molluscous and other animals of the St. Lawrence valley and Eastern Canada generally. It is an exceedingly useful and carefully drawn up paper; and as the effort of so young a man, it cannot be too highly commended. Mr. Bell bids fair to occupy a distinguished position amongst Canadian naturalists.

E. J. C.

ETHNOLOGY AND ARCHÆOLOGY.

TRACES OF HUMAN ARTS IN THE DRIFT.

At the late meeting of the British Association, at Aberdeen, several speakers, especially in the Geological Section, took occasion to revert to the highly interesting discoveries recently announced, of the finding of flint implements and other traces of human arts in the diluvial formations. It is now ten years since such discoveries were first announced by M. Boucher de Perthes, as having been made in the neighbourhood of Abbeville; but his elaborate work, entitled "Antiquités Celtiques et Antédeluviennes," contained so much vague and extravagant theorising, and was accompanied by engravings of so many so-called antediluvian works of art, with no more traces of art about them, to ordinary eyes, than any heap of broken flints by the roadside could furnish, that it attracted little attention. More recently, however, M. Aymard, distinguished alike as a palæontologist and an archæologist, has announced the discovery of portions of human skeletons embodied in the volcanic breccia near Le Puy en Velay; and attention being anew drawn to the subject, Mr. Prestwick, Sir Charles Lyell, and other Geologists of unquestionable judgment and probity, have explored the stratified gravel in the neighbourhood of Amiens and Abbeville, and produced artificially formed hatchets, spear heads, and wedges of flint, from gravel pits, at a depth of seventeen feet below the surface. The subject has naturally excited much discussion, and led to many conflicting opinions as to its bearing on the question of the antiquity of the human race, or the condition and occupants of the globe at the period of Man's introduction as the highest among its living inheritors.

The following highly interesting *résumé* of the subject was given by Sir Charles

Lyell, as President of the Geological Section of the British Association, and embodies at once the facts and the opinions which an experienced and cautious scientific geologist considers as at present to be legitimately deducible from such investigations as have yet been made:

"No subject has lately excited more curiosity and general interest among geologists and the public than the question of the antiqnity of the human race: whether or no we have sufficient evidence to prove the former co-existence of Man with certain extinct mammalia, in caves or in the superficial deposits commonly called drift, or 'diluvium.' For the last quarter of a century, the occasional occurrence, in various parts of Europe, of the bones of man or the works of his hands, in cave-breccias and stalactites associated with the remains of the extinct hyæna, bear, elephant, or rhinoceros, have given rise to a suspicion that the date of man must be carried further back than we had heretofore imagined. On the other hand, extreme reluctance was naturally felt on the part of scientific reasoners, to admit the validity of such evidence, seeing that so many caves have been inhabited by a succession of tenants, and have been selected by man as a place not only of domicile, but of sepulture; while some have also served as the channels through which the waters of flooded rivers have flowed, so that the remains of living beings which have peopled the district at more than one era, may have subsequently been mingled in such caverns, and confounded together in one and the same deposit. The facts, however, recently brought to light during the systematic investigation, as reported on by Falconer, of the Brixham Cave, must, I think, have prepared you to admit that scepticism in regard to the cave-evidence in favour of the antiquity of man had previonsly been pushed to an extreme. To escape from what I now consider was a legitimate deduction from the facts already accumulated, we were obliged to resort to hypotheses requiring great changes in the relative levels and drainage of valleys, and, in short, the whole physical geography of the respective regions where the caves are situated,—changes that would alone imply a remote antiquity for the human fossil remains, and make it probable that man was old enough to have co-existed, at least, with the Siberian mammoth. But, in the course of the last fifteen years, another class of proofs have been advanced, in France, in confirmation of man's antiquity, into two of which I have personally examined in the course of the present summer, and to which I shall now briefly advert. First, so along ago as the year 1844, M. Aymard, an eminent palæontologist and antiquary, published an account of the discovery, in the volcanic district of central France, of portions of two human skeletons (the skulls, teeth, and bones) embedded in a volcanic breccia found in the mountain of Denise, in the environs of Le Puy en Velay, a breccia anterior in date to one, at least, of the latest eruptions of that volcanic mountain. On the opposite side of the same hill, the remains of a large number of mammalia, most of them of extinct species, have been detected in tufaceous strata, believed, and I think correctly, to be of the same age. The authenticity of the human fossils was from the first disputed by several geologists, but admitted by the majority of those who visited Le Puy, and saw with their own eyes the original specimen now in the museum of that town. Among others, M. Pictet, so well known to you by his excellent work on Palæontology, declared, after his visit to the spot,

his adhesion to the opinions previously expressed by Aymard. My friend, Mr. Scrope, in the second edition of his 'Volcanoes of Central France,' lately published, also adopted the same conclusion, although after accompanying me this year to Le Puy, he has seen reason to modify his views. The result of our joint examination,—a result which I believe essentially coincides with that arrived at by MM. Hébert and Lartet, names well known to science, who have also this year gone into this inquiry on the spot,—may thus be stated: We are by no means prepared to maintain that the specimen in the museum at Le Puy—which unfortunately was never seen in situ by any scientific observer,—is a fabrication. On the contrary, we incline to believe that the human fossils in this and some other specimens from the same hill, were really imbedded by natural causes in their present matrix. But the rock in which they are entombed consists of two parts, one of which is a compact and, for the most part, thinly laminated stone, into which none of the human bones penetrate; the other, containing the bones, is a lighter, and much more porous stone, without lamination, to which we could find nothing similar in the mountain of Denise, although both M. Hébert and I made several excavations on the alleged site of the fossils. M. Hébert, therefore, suggested to me, that this more porous stone, which resembles in colour and mineral composition, though not in structure, parts of the genuine old breccia of Denise, may be made up of the older rock broken up and afterwards re-deposited, or, as the French say, '*remané*,' and therefore of much newer date; an hypothesis which well deserves consideration; but I feel that we are at present so ignorant of the precise circumstances and position under which these celebrated human fossils were found, that I ought not to waste time in speculating on their probable mode of interment, but simply declare that, in my opinion, they afford no demonstration of Man having witnessed the last volcanic eruptions of central France. The skulls, according to the judgment of the most competent osteologists who have yet seen them, do not seem to depart in a marked manner from the modern European or Caucasian type, and the human bones are in a fresher state than those of the Elephas meridionalis, and other quadrupeds found in any breccia of Denise which can be referred to the period even of the latest volcanic eruptions. But while I have thus failed to obtain satisfactory evidence in favour of the remote origin assigned to the human fossils of Le Puy, I am fully prepared to corroborate the conclusions which have recently been laid before the Royal Society by Mr. Prestwich, in regard to the age of the flint implements associated in undisturbed gravel, in the north of France, with the bones of elephants, at Abbeville and Amiens. These were first noticed at Abbeville, and their true geological position assigned to them by M. Boucher de Perthes, in 1849, in his 'Antiquités Celtiques;' while those of Amiens were afterwards described in 1855, by the late Dr. Rigollot. For a clear statement of these facts, I may refer you to the abstract of Mr. Prestwick's Memoir, in the Proceedings of the Royal Society for 1859, and have only to add that I myself have obtained abundance of flint implements (some of which are laid upon the table) during a short visit to Amiens and Abbeville. Two of the worked flints of Amiens were discovered in the gravel-pits of St. Acheul—one at the depth of ten feet and the other of seventeen feet below the surface, at the time of my visit; and M. Georges Pouchet, of

Rouen, author of a work on the 'Races of Man,' who has since visited the spot, has extracted with his own hands one of these implements, as Messrs. Prestwick and Flower had done before him. The stratified gravel, resting immediately on the chalk in which these rudely-fashioned instruments are buried, belongs to the post-pliocene period, all the fresh water and land shells which accompany them being of existing species. The great number of the fossil instruments which have been likened to hatchets, spear-heads, and wedges, is truly wonderful. More than a thousand have already been met with in the last ten years, in the valley of the Somme, in an area fifteen miles in length. I infer that a tribe of savages, to whom the use of iron was unknown, made a long sojourn in this region; and I am reminded of a large Indian mound, which I saw in St. Simond's Island, in Georgia,—a mound ten acres in area, and having an average height of five feet, chiefly composed of cast-away oyster shells, throughout which arrow heads, stone axes, and Indian pottery are dispersed. If the neighbouring river, the Alatamaha, or the sea which is at hand, should invade, sweep away, and stratify the contents of this mound, it might produce a very analogous accumulation of human implements, unmixed perhaps with human bones. Although the accompanying shells are of living species, I believe the antiquity of the Abbeville and Amiens flint instruments to be great indeed, if compared to the times of history or tradition. I consider the gravel to be of fluviatile origin, but I could detect nothing in the structure of its several parts indicating cataclysmal action; nothing that might not be due to such river-floods as we have witnessed in Scotland during the last half century. It must have required a long period for the wearing down of the chalk which supplied the broken flints for the formation of so much gravel at various heights, sometimes one hundred feet above the present level of the Somme, for the deposition of fine sediment, including entire shells, both terrestrial and aquatic, and also for the denudation which the entire mass of stratified d ift has undergone, portions having been swept away, so that what remains of it often terminates abrubtly in old river-cliffs, besides being covered by a newer unstratified drift. To explain these changes, I should infer considerable oscillations in the level of the land in that part of France—slow movements of upheaval and subsidence, deranging, but not wholly displacing, the course of the ancient rivers. Lastly, the disappearance of the elephant, rhinoceros, and other genera of quadrupeds now foreign to Europe, implies, in like manner, a vast lapse of ages, separating the era in which the fossil implements were framed and that of the invasion of Gaul by the Romans.

"Among the problems of high theoretical interest which the recent progress of Geology and Natural History has brought into notice, no one is more prominent, and at the same time more obscure, than that relating to the origin of species. On this difficult and mysterious subject, a work will very shortly appear, by Mr. Charles Darwin, the result of twenty years of observation and experiment in Zoology, Botany, and Geology, by which he has been led to the conclusion, that those powers of nature which give rise to races and permanent varieties in animals and plants, are the same as those which, in much longer periods, produce species, and, in a still longer period of ages, give rise to differences of generic rank. He appears to me to have succeeded, by his investigations and reasonings, to have thrown a flood of light on many classes of pheuomena connected with the affini-

ties, geographical distribution, and geological succession of organic beings, for which no other hypothesis has been able, or has even attempted, to account.

"Among the communications sent in to this Section, I have received from Dr. Dawson, of Montreal, one confirming the discovery, which he and I formerly announced, of a land shell, or pupa, in the coal formation of Nova Scotia. When we contemplate the vast series of formations intervening between the Tertiary and Carboniferous strata, all destitute of air-breathing mollusca, at least of the terrestrial class, such a discovery affords an important illustration of the extreme defectiveness of our geological records. It has always appeared to me, that the advocates of progressive development have too much overlooked the imperfection of these records, and that, consequently, a large part of the generalisations in which they have indulged in regard to the first appearance of the different classes of animals, especially of air-breathers, will have to be modified or abandoned. Nevertheless, that the doctrine of progressive development may contain in it the germs of a true theory, I am far from denying."

In the same section, on the following day, the Rev. Dr. Anderson took up the main subject of "Human remains in the Superficial Drift," and after reviewing the nature of the various evidence advanced, he thus proceeded:—As to the instances occurring in beds of lakes, rivers, and seas, and which have become mineralized, he contended that a few years, or even months, often sufficed for the formation of a compact durable mass of calcareous and silicious rock, in which human bones, skeletons, pottery, coins, and implements were imbedded. He referred to a case betwixt Aberdour and Burntisland, in Fife, which he examined a few weeks ago, where an incrustation was now forming of great depth, and in which are imbedded land shells, branches of trees, and where on the face of the incrusted cliff, twigs of the living trees are becoming entangled in the calcareous breccia. He then quoted the case of a cannon-ball—a thirty-two pounder,—lately presented to him by a fellow townsman, deeply incrusted with ferruginous mud, and completely indurated, which was raised on his anchor in the Harbour of Copenhagen: and, he doubted not, an identical bullet of our naval attack of fifty years ago. The skulls of Amiens and Abbeville, the remains in the caverns of Torquay, and those in Sicily, the flint weapons in veined limestone in Cantire, and the arrow-heads with elephant remains in Suffolk, were then successively brought under review in the paper—the solution of all these given by Dr. Anderson being, that from the action of petrifying springs, the subsidence of tracts of country, the falling-in of the roofs of caverns, the undermining of cliffs and headlands, the superficial soil is incrusted or buried beneath the strata on which it was originally superimposed. He saw no evidence deducible from the superficial drifts to warrant a departure from the usually accepted data of man's very recent introduction upon the earth. We have more positive evidence that his first appearance was characterized by many proofs of high intellectual condition which our sacred beliefs attach to his origin, and that he was not primarily the ignoble creature that arrow-heads, and flint-knives, and ossiferous caverns would so lamentably indicate.

MONTHLY METEOROLOGICAL REGISTER, AT THE PROVINCIAL MAGNETICAL OBSERVATORY, TORONTO, CANADA WEST,—AUGUST, 1859.

Latitude—43 deg 39.4 min. North. Longitude—5 h. 17 m. 33 s. West. Elevation above Lake Ontario, 108 feet.

Day.	Barom. at temp. of 32°. 6 A.M.	2 P.M.	10 P.M.	Mean.	Temp. of the Air. 6 A.M.	2 P.M.	10 P.M.	ME'N	Excess of mean above Average	Tens. of Vapour. 6 A.M.	2 P.M.	10 P.M.	M'N	Humidity of Air. 6 A.M.	2 P.M.	10 P.M.	M'N	Direction of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't. Direction.	Velocity of Wind. 6 A.M.	2 P.M.	10 P.M.	Result't.	ME'N	Rain in inches.	Snow in inches.
					°	°	°	°	°												°							
1	29.454	29.509	29.553	29.5093	64.6	74.3	64.0	67.92	+ 0.95	545	.457	436	.481	.90	.63	73	.69	S W b S	W S W	N b W	N 83 W	4.5	4.2	4.0	2.57	3.76	...	...
2	.604	.625	.600	.6095	58.1	71.5	66.0	66.40	— 0.45	403	350	300	381	.84	45	56	.60	W b N	E b S	E N E	N 64 E	2.4	6.2	9.8	4.06	4.40	...	...
3	.621	.556	525	.5582	61.3	73.8	65.5	67.88	+ 1.03	385	603	682	541	.70	.72	91	.79	N E b E	E b S	E S E	N 67 E	1.8	6.8	1.6	2.85	3.87	1.375	...
4	.306	.449	.509	.4237	63.1	75.1	66.4	67.92	+ 1.12	537	536	534	539	93	61	82	.70	N b W	N W b W	S b W	N 56 W	8.8	9.0	4.0	4.11	6.26	.035	...
5	.527	.516	.591	.5512	59.2	74.3	65.9	64.10	— 2.70	437	386	299	366	87	.45	66	.62	Calm	N W b W	Calm.	N 59 W	0.0	18.0	0.0	6.21	6.20	...	...
6	.638	.609	564	.5982	56.3	72.7	62.4	64.80	— 1.97	326	477	444	.410	71	59	79	67	N W b W	S S W	S W	S 45 W	9.0	8.0	0.6	4.20	4.82	...	...
7	.515	.475	—	—	63.1	81.4	—	—	—	408	473	—	—	70	.44	—	—	W b S	N W b W	N N W	N 40 W	1.8	11.0	6.0	7.24	8.01	...	...
8	.668	.720	706	7013	57.0	72.5	63.1	65.37	— 1.80	328	458	436	406	70	57	.75	.65	W b N	E S E	E b S	N 60 E	0.5	3.5	2.0	2.05	2.09	...	...
9	.789	.769	.763	.7603	59.9	74.7	65.0	68.03	+ 1.48	427	631	441	497	83	67	.71	.72	N E b N	E S E	N E	N 63 E	1.2	2.8	2.4	2.22	3.37	...	...
10	.756	.708	.662	.6075	63.4	74.7	68.9	70.63	+ 4.12	356	621	541	523	81	.73	77	80	N b E	E	E N E	N 78 E	1.2	4.6	3.4	2.51	2.79	...	...
11	.625	.658	.506	5043	65.7	75.8	65.3	69.80	+ 3.37	550	651	499	588	88	.73	78	.80	Calm.	E b S	S b E	N 61 E	0.0	0.8	0.4	0.91	3.09	.080	...
12	.558	.658	548	5560	67.8	72.0	69.0	69.98	+ 3.65	641	587	588	614	.94	.73	86	84	Calm.	E	N E b E	N 70 E	0.0	9.8	6.0	4.47	4.81	...	...
13	.603	.590	.580	.5800	67.8	74.7	66.7	69.87	+ 3.63	583	606	571	677	86	.71	87	79	N E	S b E	S b W	S 19 E	2.2	8.2	1.0	2.16	2.91	...	...
14	.571	.556	—	—	64.2	78.7	—	—	—	543	670	—	—	.90	.60	—	—	Calm	S	N W b N	N 80 W	0.0	4.2	5.0	0.04	4.42	...	...
15	.604	.391	.644	6167	66.6	70.0	68.9	72.90	+ 6.76	504	657	589	609	72	.47	.83	.73	N N W	E b N	E N E	N 77 E	4.4	7.5	4.2	4.03	4.97	inap.	...
16	.687	.680	698	6902	68.6	75.1	69.1	72.02	+ 6.00	530	543	626	558	76	62	80	72	N E b N	N b S	N E b E	N 79 E	5.2	9.0	4.2	5.03	5.39	...	...
17	.740	.727	.696	.7155	66.4	78.5	68.9	72.28	+ 6.27	602	511	625	558	99	53	.80	76	N E b E	S S E	E b S	S 71 E	1.0	4.8	2.0	3.07	3.89	...	...
18	.635	.524	.508	.5518	64.6	77.6	63.5	68.38	+ 2.58	558	583	455	515	92	.61	77	74	N E b E	S b W	N N W	N 62 W	1.8	11.4	16.8	5.53	9.09	.180	...
19	.605	.610	.664	.6202	56.6	72.9	69.1	64.83	— 0.03	372	256	203	305	.81	31	.52	.52	N W b N	N N W	N N W	N 17 W	11.5	13.6	6.2	10.16	10.39	...	...
20	.739	.741	.718	7382	58.6	73.1	64.0	66.50	+ 0.93	360	378	431	360	72	47	.71	57	N b W	S b E	S b E	S 5 E	5.2	11.2	3.0	3.60	4.43	...	...
21	.746	.743	—	—	57.4	75.1	—	—	—	345	391	—	—	73	.45	—	—	E b N	E b S	E	N 88 E	2.9	5.8	2.5	3.46	4.00	...	...
22	.670	.637	.597	.6805	61.6	73.1	70.7	69.78	+ 4.43	461	470	546	.497	85	57	.73	69	N E	E	E b S	S 60 E	3.6	10.8	5.5	6.99	8.05	.170	...
23	.608	.567	.572	.5848	66.4	70.5	66.4	66.85	+ 1.72	520	507	610	545	80	.68	.94	.83	E S E	S E b S	S S W	S 15 E	5.3	6.2	16.5	7.00	8.18	1.655	...
24	.503	.443	.463	4027	64.6	70.0	62.4	65.97	+ 1.02	558	564	521	550	.92	.79	92	80	S W b S	S b W	W	S 43 W	6.2	6.0	0.5	2.61	3.95	.315	...
25	.488	.510	.577	5280	58.4	73.8	62.6	65.65	+ 0.92	417	448	463	435	92	54	71	70	N W b W	W N W	W N W	N 68 W	10.5	11.6	5.4	6.85	6.91	...	...
26	.574	.501	515	.5300	59.2	76.2	66.7	68.42	+ 3.88	413	646	414	482	82	74	62	70	N W	S b W	N W b N	N 79 W	4.4	9.0	9.5	4.05	6.05	inap.	...
27	.570	605	658	6117	57.7	66.4	54.8	60.15	— 4.17	346	347	124	333	72	62	.75	65	N W b W	N W b N	N N W	N 30 W	3.4	14.6	6.0	11.01	11.50	...	...
28	.668	.701	—	—	51.2	59.2	—	—	—	277	187	—	—	73	37	—	—	N N W	N W	N W b N	N 34 W	8.6	19.5	4.1	11.53	11.60	...	...
29	.778	.706	680	.7170	48.0	67.1	52.7	58.28	— 7.53	248	.172	225	219	.74	26	56	52	N W b N	N W	N b W	N 30 W	2.8	14.0	1.0	0.57	6.71	...	...
30	.635	.486	.474	5178	48.2	68.7	68.1	59.15	— 4.47	202	300	333	317	83	.42	81	65	W N W	W b S	N W	S 85 W	0.5	13.0	9.0	5.93	7.20	.040	...
31	.470	.400	.552	4948	53.7	60.5	51.9	56.63	— 6.68	344	.312	268	268	83	.58	.69	65	N W b W	N W	W N W	N 68 W	2.5	14.8	5.0	9.21	9.09	.140	...
M	29.6091	29.5907	29.5907	29.5990	60.87	72.96	63.71	66.01	+ 0.85	.446	.483	461	463	.82	69	76	.70					4.05	9.18	4.40		5.96	3.990	...

REMARKS ON TORONTO METEOROLOGICAL REGISTER FOR AUGUST, 1859.

Highest Barometer . . . . 29.811 at 8 a. m. on 9th, } Monthly range=
Lowest Barometer . . . . 29.306 at 6 a. m. on 4th, } 0.505 inches.

Self-registering Ther.:
- Maximum temperature . . . . 82°2 on p.m. of 7th } Monthly range=
- Minimum temperature . . . . 45°8 on a. m. of 30th } 36°4
- Mean maximum temperature . . 75°01 } Mean daily range = 15°63.
- Mean minimum temperature . . 59°38 }
- Greatest daily range . . . . . . 24°7 from a. m. to p.m. on 30th.
- Least daily range . . . . 5.2 from a. m. to p. m. on 23rd.

Warmest day . . . 15th ... Mean Temperature . . . 72°90 } Difference=16°62.
Coldest day . . . . 29th .. Mean Temperature . . . 56°28 }

Maximum Radiation { Solar . . . . 97°0 on p. m. of 11th } Monthly range=
{ Terrestrial . . . . 33.6 on a. m. of 30th } 63°4.

Aurora observed on 4 nights, viz. : 19th, 21st, 28th, and 29th ; possible to see Aurora on 23 nights; impossible on 8 nights.

Raining on 11 days, depth, 3.990 inches, duration of fall, 39.9 hours.

Mean of cloudiness=0 40 ; most cloudy hour observed, 8 a. m., mean=0.48 : least cloudy hour observed, 10 p. m., mean=0.32.

Sums of the components of the Atmospheric Current, expressed in Miles.

North.	South.	East.	West.
1886.14	915.87	1076.21	1794.02

Resultant direction, N 36° W ; Resultant Velocity, 1.62 miles per hour.
Mean velocity of the wind 5.96 miles per hour.
Maximum velocity . . . . 23.0 miles per hour, from 9 to 10 a.m. on 27th.
Most windy day . . . . 28th—Mean velocity, 11.80 miles per hour.
Least windy day . . . . 8th—Mean velocity, 2.69 do
Most windy hour, 1 to 2 p. m.—Mean velocity, 9.50 do } Difference
Least windy hour, 7 to 8 a. m.—Mean velocity, 3.85 do } 5.65 miles.

1st. Sheet Lightning round horizon in S. W. 11 p. m. to midnight.
2nd. Sheet Lightning from 8 to 9 p. m.
6th. Halo round the Sun at noon.
8th. Corona round the Moon, 10 p m. to midnight.
11th. Thunderstorm and slight Rain, 4 to 5 p. m.
12th. Fog 6 to 8 a. m. Low scud passing rapidly from E.
15th. Distant Thunder and slight Rain, 4 to 5 p. m.
16th. Dense wetting Fog, 0 10 p m to 6 a.m. Corona round the moon at 0.20 a.m.
18th. Thunderstorm and heavy Rain, 0 15 to 0.45 p.m. Beautiful sunset.
24th. Sheet and Forked Lightning, 9 p. m. to midnight.
26th. Magnificent Auroral display from 7 p. m.
28th. Heavy gusts of Wind, Rain, and Hail during the forenoon.

The Resultant Direction and Velocity *of the Wind for the month of August, from* 1848 to 1859 inclusive, were respectively N. 59° W., and 0 82 miles.

The month of August, 1859, was warm, moist, and windy. The mean temperature having been 0°.5 above the average of 20 years. The depth of rain 1.063 inches on the surface greater than the average of 19 years, and the mean velocity of the wind 0.76 miles per hour in excess of the average of 12 years.

COMPARATIVE TABLE FOR AUGUST.

YEAR.	TEMPERATURE.					RAIN.		SNOW.		WIND.		
	Mean.	Difference from Average.	Maximum observed.	Minimum observed.	Range.	No. of days.	Inches.	No. of days.	Inches.	Resultant Direction.	Resultant Velocity.	Mean Velocity
	°	°	°	°	°					°		
1840	64.7	– 1.4	80.1	47.4	32.7	12	2.905	...	...	...	...	...
1841	64.4	– 1.7	83.5	46.7	36.8	9	6.170	..	...	...	...	0.19 lbs
1842	65.7	0.4	80.7	45.3	35.4	6	2.500		...	...	...	0.30 "
1843	66.4	+ 0.3	85.5	44.4	41.1	4	4.850	...	...	...	...	0.12 "
1844	64.3	1.8	82.5	44.3	38.2	17	imper	.	...	...	...	0.16 "
1845	67.9	+ 1.8	82.5	44.4	38.1	9	1.725	.	...	...	...	0.19 "
1846	68.4	+ 2.3	86.3	50.4	35.9	9	1.770	...	...	...	...	0.17 "
1847	65.1	– 1.0	83.1	44.9	38.2	10	2.140	...	...	...	..	0.19 "
1848	69.2	+ 3.1	87.5	49.3	38.2	8	0.855	...	...	S 21 E	0.98	4.55 ms.
1849	66.3	+ 0.2	79.5	51.4	28.1	10	4.970	...	...	N 71 W	0.60	3.76 "
1850	66.8	+ 0.7	84.2	43.0	41.2	13	4.355	...	...	N 15 E	0.35	4.46 "
1851	63.6	– 2.5	79.8	43.6	36.2	10	1.380	.	...	N 63 W	0.40	4.63 "
1852	65.9	– 0.2	81.2	46.7	34.5	9	2.696	.	...	N 70 E	0.56	3.30 "
1853	68.6	+ 2.5	91.6	47.6	44.0	11	2.576		...	S 36 E	0.30	4.26 "
1854	68.0	+ 1.9	98.1	47.0	51.1	5	0.455	...	...	N 64 W	1.76	4.80 "
1855	64.1	– 2.0	82.1	44.9	37.2	7	1.455	..	...	N 63 W	1.04	6.97 "
1856	63.6	– 2.5	81.3	44.0	37.3	12	1.680	...	...	N 50 W	2.88	7.03 "
1857	65.3	– 0.8	85.3	50.1	35.2	13	5.285	.		N 77 W	1.51	6.38 "
1858	67.6	+ 1.5	83.4	45.4	38.0	11	3.890	..		N 60 W	1.57	6.50 "
1859	66.6	+ 0.5	81.4	46.2	35.2	11	3.990		...	N 36 W	1.62	5.98 "
Mean	66.12	...	83.99	46.35	37.63	9.8	2.927	..	...	...	..	5.20

INDEX.

METEOROLOGICAL TABLES—TORONTO, C.W.

ST. MARTIN'S, ISLE JESUS, C.E.

END OF VOL IV.

LOVELL AND GIBSON, PRINTERS, TORONTO.